MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

Department Of Computer Science and Engineering

STUDENT HAND BOOK
FOR
III B.Tech I Sem

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COMPUTER SCIENCE AND ENGINEERING

COURSE DESCRIPTION FORM

Course Title	**OPERATING SYSTEMS**			
Course Code	**2050510**			
Regulation	**R20**			
Course Structure	Lectures	Tutorials	Practicals	Credits
	3	-	-	3
Course Faculty	Md.Praveez, Asst.Prof			

COURSE OVERVIEW:

This course provides a comprehensive introduction to operating system design concepts, data structures and algorithms. The course is designed to provide in-depth critique on the problems of resource management and scheduling, concurrency and synchronization, memory management,file management, peripheral management, protection and security. This course is intended to discuss thetopics in a general setting not tied to any one particular operating system. Throughout the course, the study of practical aspects that pertain to the most popular operating systems such as Unix/Linuxand Windows are considered as case studies.

PREREQUISITE(S):

Level	Credits	Periods/ Week	Prerequisites
UG	3	3	Data Structures and Algorithms, Computer Architecture

II.MARKS DISTRIBUTION:

Sessional Marks	University End Exam Marks	Total Marks
Midterm Test There shall be two midterm examinations. Each midterm examination consists of essay paper. The essay paper is for 25 marks of 90 minutes duration and shall contain PART-A and PART-B. PART-A of 10 marks, It consists 10 questions student has to answer all questions each carries 1 Mark, PART-B of 15 marks, It contains 3 questions with internal choice, each question carries 5 marks.	70	100

III.EVALUATION SCHEME:

S. No	Component	Duration	Marks
1.	I Mid Examination	90 minutes	25
2.	I Assignment	-	5
3.	II Mid Examination	90 minutes	25
4.	II Assignment	-	5
5.	External Examination	3 hours	70

IV. COURSE OBJECTIVES:

At the end of the course, the students will be able to:

I. Be familiar with the fundamental principles of the operating system, its services andfunctionalities.
II. Master the concepts of processes, inter-process communication, synchronization andscheduling.
III. Be familiar with different types of memory management viz. virtual memory, paging andsegmentation.
IV. Be familiar with analyzing the performance of memory management techniques in variousreal-time scenarios.
V. Master the concepts of data input/output, storage and file management.
VI. **Be familiar with deadlocks and distinguish the techniques for deadlock detection,**prevention, recovery.
VII. Be familiar with the need for protection in computer systems and the availabletechniques for protection.

V. COURSE OUTCOMES:

At the end of the course the student will develop ability to

CO	Course outcome	Blooms taxonomy level
C311.1	Infer the issues to be considered in the design and development of operating system	Apply
C311.2	Demonstrate the usage of Unix commands, system call interface for process management, interprocess communication and I/O in Unix	Apply
C311.3	Create control access to a computer and the files that shared	Analyse
C311.4	Resolve user problems with standard operating environments.	Analyse
C311.5	Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.	Create

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by
PO1	**Engineering Knowledge** Appl the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization the solution of complex engineering problems.	H	Assignments, Tutorials
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	H	Assignments
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	S	Mini Projects
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research Methods design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	S	Projects
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an	S	Projects

	understanding of the limitations.		
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	N	- -
PO7	Environment and sustainability: Understand the impact of the professional engineerig Solution in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development .	N	- -
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and	N	- -
	responsibilities and norms of the engineeringpractice.		
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	N	- -
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports design documentation, make effective presentations, and give and receive clear instructions.	N	- -

PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‟s own work, as a member and leader in a team, to manage projects in multidisciplinary and environments.	N	- -
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in broadest context of technological change.	S	Lectures, Projects

N - None **S - Supportive** **H - Highly Related**

VII. SYLLABUS:

UNIT - I

Operating System Introduction: Operating Systems objectives and functions, Computer System Architecture, OS Structure, OS Operations, Evolution of Operating Systems - Simple Batch, Multi programmed, time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time systems, Special-Purpose Systems, Operating System services, User OS interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure, Virtual Machines.

UNIT – II

Process and CPU Scheduling - Process Concepts-The Process, Process State, Process Control Block, Threads, Process Scheduling-Scheduling Queues, Schedulers, Context Switch, Preemptive Scheduling, Dispatcher, Scheduling Criteria, Scheduling algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Thread Scheduling, Case Studies: Linux, **Windows.**Process Coordination-Process Synchronization, The Critical Section Problem,Peterson‟solution,solution Hardware, Semaphores, and Classic Problems of Synchronization, Monitors,Case Studies: Linux,wINDOWS

UNIT – II Memory Management and Virtual Memory – Logical & Physical Address Space, Swapping, Contiguous Allocation, Paging, Structure of Page Table, Segmentation, Segmentation with Paging, Virtual Memory, Demand Paging, Performance of Demanding Paging, Page Replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing.

UNIT – IV File System Interface – The Concept of File, Access methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Implementation – File System Structure,FileSystem Implementation, Allocation methods, Free-Space Management, Directory Implementation, Efficiency and Performance.

Mass Storage Structure – Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, and Swap space Management.

UNIT – V Deadlocks – System Model, Deadlock Characterization, Methods for HandlingDeadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from
Deadlock

Protection – System Protection, Goals of Protection, Principles of Protection, Domain of Protection,Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection.

Text books:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Principles", 8e, WileyStudent
   Edition.
2. W. Stallings, "Operating Systems - Internals and Design Principles", 6e, Pearson.

References:

1. S. Godbole, "Operating Systems", 2e, TMH.
2. P. C. P. Bhatt, "An Introduction to Operating Systems", PHI.
3. S. Haldar and A. A. Aravind, "Operating Systems", Pearson Education.
4. T. W. Doeppner, "Operating Systems in Depth", Wiley.

VIII.COURSE PLAN:

At the end of the course, the students are able to achieve the following course learningoutcomes:

Lecture No.	Topics to be covered	Course Learning Outcomes	Reference
1 - 2	**Operating System Introduction:** Operating Systems Objectives & Functions, Computer System Architecture, OS Structure And Operations	**Understand** the importance ofOS and its functions	T2: 2.1 T1: 1.1 - 1.5
3 - 4	Evolution of Operating Systems - Simple Batch, Multi programmed, time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time systems, Special-Purpose Systems	**Associate** the types of operating systems with real-life applications	T2: 2.2
5 - 6	OS Services, User OS Interface, Systems Calls, Types of Systems Calls, System Programs	**Interpret** the OS services and system calls	T1: 2.1 - 2.5
7 - 8	OS Design & Implementation, OS Structure, Virtual Machines	**Explain** the benefits of building abstract layers in hierarchical fashion and virtualization	T1: 2.6 - 2.8
	Process & CPU scheduling: Process Concepts, Process Scheduling - Scheduling Queues, Schedulers, Context	**Compare** and **contrast** the common algorithms used for both preemptive and non-preemptive	T1: 3.1 - 3.4 T2: 3.1 - 3.4

9 - 10	Switch, Preemptive Scheduling, Dispatcher	scheduling of tasks in operating systems	
11 - 13	Scheduling Criteria, Scheduling Algorithms		T1: 5.2 - 5.3
14	Multiple Processor Scheduling, Real-Time Scheduling	**Examine** appropriate scheduling algorithm for real-lifeapplications	T1: 5.5 T2:10.1-10.2
15	Thread Scheduling	**Infer** advantages of threads over processes	T1: 5.4
16	Case Studies - Linux, Windows	**Associate** the process management in real operating systems	T1:5.6, 21.4 T2: 8.3 - 8.5
17 - 19	**Process coordination:** Process Synchronization, The Critical - Section Problem, Peterson"s Solution, Synchronization Hardware	**Summarize** the range of mechanisms that can be employed at the operating system level to realize concurrent systems and describe the benefits of each.	T1: 6.1 - 6.4
20 - 21	Semaphores & Classical Problems of Synchronization, Monitors	**Understand** classical problemsof synchronization	T1: 6.5 - 6.7
22	Case Studies: Linux, Windows	**Discuss** process synchronizationin real operating systems	T2: 6.7 - 6.8, 6.10
23 - 24	**Memory Management & Virtual** **Memory:** Logical & Physical Address Space, Swapping, Contiguous Memory Allocation	**State** basics of memory management	T1: 8.1 - 8.3

25 - 26	Paging, Structure of Page Table	**Demonstrate** the concepts of memory management such as paging and segmentation	T1: 8.4 - 8.5
27	Segmentation, Segmentation with Paging		T1: 8.6
28 - 29	Virtual Memory, Demand Paging,	**Illustrate** the benefits of virtual	T1: 9.1 -
	Performance of Demand Paging	memory and demand paging	9.2
30 - 32	Page Replacement, Page Replacement Algorithms	**Order** the page replacement algorithms according to their performance	T1: 9.4
33	Allocation of Frames, Thrashing		T1: 9.5 - 9.6
34	**File system Interface:** Concept of File, Access Methods, Directory Structures	Summarize the full range of considerations that support file systems. Compare and contrast different approaches to file organization, recognizing the strengths and weaknesses of each.	T1:10.1 -10.3
35 - 36	File System Mounting, File Sharing, Protection, File System Structure, Implementation	**Outline** the issues of file system implementation	T1:10.4 -10.6 T1:11.1 -11.2
37 - 38	File Allocation Methods	**Define** file allocation methodsand	T1: 11.4
39 - 40	Free-Space Management, Directory Implementation, Efficiency and Performance	performance metrics	T1: 11.3, 11.5 -11.6
41 - 42	**Mass Storage Structure:** Overview, Disk	**Distinguish** between various	T1:12.1-

	Structure, Disk Attachment	techniques for disk management	2.4
43 - 44	Disk Scheduling and Management, Swap-Space Management		T1:12.5 -12.6
45	**Deadlocks:** System Model, Deadlock Characterization	Explain conditions that lead to deadlock and differentiate between deadlock, starvation, and race conditions.	T1: 7.1 - 7.2
46 - 48	Methods of Handling Deadlocks, Deadlock Prevention and Avoidance	**Understand** the difference between preventing and avoiding deadlocks.	T1: 7.3 - 7.5
49 - 50	Dead Lock Detection, Recovery from Deadlock		T1: 7.6 - 7.7
51 - 52	**Protection:** System Protection, Goalsof Protection, Principles of Protection, Domain of Protection	**Quote** the goals and principles of system protection	T1:14.1- 14.3
53 - 54	Access Matrix, Implementation ofAccess Matrix, Access control, Revocation of Access Rights	**Clarify** the different types ofaccess control	T1:14.4 -14.7
55 - 56	Capability- Based systems, Language - Based Protection	**Match** appropriate protection system for the needs	T1:14.8 -14.9

IX.MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Program outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO 1**	**PSO 2**	**PSO 3**
C311.1	3	2	2	2	0	0	0	0	0	0	0	1	3	0	0
C311.2	3	2	2	2	0	0	0	0	0	0	0	1	3	0	3
C311.3	3	2	2	2	0	0	0	0	0	0	0	1	3	0	3
C311.4	3	2	2	2	3	0	0	0	0	0	0	1	3	0	3
C311.5	3	0	0	0	0	0	0	0	0	0	0	1	3	0	3
Average	**3**	**2**	**2**	**2**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**0**	**3**

ASSIGNMENT

Course Name	:	**Operating System**
Course Code	:	**2050510**
Class	:	III B. Tech I Semester
Branch	:	Computer Science and Engineering
Year	:	2020-21
Course Faculty	:	Md.Praveez, Asst.Prof

OBJECTIVES:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner‟s learning process.

ASSIGNMENT – I & II

S. No.	Questions	Blooms Taxonomy Level	Course Outcome
	UNIT - I		
1	**Explain** in detail the types of system calls provided by atypical operating system?	Understand	1
2	**Compare** Tightly coupled systems and loosely coupled systems.	Understand	1
3	**Define** Operating System Operations and Structures	Knowledge	1
4	**Compare** and contrast Multiprogramming, Multitasking and Multiprocessing.	Apply	1
5	a. **Define** an operating system? State and explain the basicfunctions or services of an operating system. b. **List** the differences between multiprogramming and Time-sharing systems.	Understand Knowledge	1
6	Briefly **Explain** various managements of operating systems andtheir responsibilities in detail?	Understand	1
7	**Explain** about context switching with necessary diagram?	Understand	1
8	**Define** the system structure of Modern Operating System?	Understand	1
9	Briefly **Compare** the different operating system structures?	Apply	1
10	**Compare** Batch operating system and Time Sharing operating system?	Apply	1

S. No.	Questions	Blooms Taxonomy Level	Course Outcome
11	**Explain** how do clustered systems differ from multiprocessorsystems? What is required for two machines belonging to a cluster tocooperate to provide a highly available service?	Understand	1
12	**List** and discuss the various services provided by the operatingsystem?	Knowledge	1
13	**Explain** the advantages and disadvantages of using the systemcalls interface for manipulating both files and devices?	Understand	4
14	**Distinguish** between the client-server and peer-to-peer models of distributed systems?	Understand	1
	UNIT – II		
1	**Define** Monitor? Compare it with semaphore. Explain in detail a monitor with notify and broadcast using an example.	Knowledge	2
2	**Differentiate** I/O bound program and CPU bound program?	Understand	2
3	**Define** semaphore? Explain the application of semaphore.	Knowledge	2
4	**Give** short note about the following : a. Binary Semaphores. b. b. Bounded Waiting.		2
5	**List** out the various process states and briefly explain with a state diagr am.	Knowledge	2
6	a. **Describe** process scheduling? Explain the various levelsof scheduling. b. **Compare** and contrast pre-emptive and non-pre-emptive	Understand Analyze	2

	algorithm.		
7	**Explain** how the concurrent processes cooperate by sharing andby communication	Understand	2
8	**Discuss** about the actions taken by the kernel to context switchbetween the processes?	Understand	2
9	**List** five services provided by an operating system that aredesigned to make it more convenient for users to use the computer system. Inwhat cases it would be impossible for user-level programs to providethese services? Explain.	Knowledge	2
10	**State** the purpose of short-term, medium-term and long term schedulers. Also discuss the differences among them.	Knowledge	2
11	**Describe** the following a. Virtual Machine b. Process state c. Process Control Block	Knowledge	2
12	**Define** Process? Explain different Process States?	Knowledge	2
13	**Describe** the following a. Race Condition b. Process Interaction	Knowledge	2
	UNIT – III		
1	**Describe** the file system of UNIX? **Compare** the main memory organization schemes of contiguous- memory allocation, segmentation, and paging with respect to the following issues	Knowledge	1

2	A. external fragmentation B. internal fragmentation C. ability to share code across processes	Apply	2
3	**Describe** Belady's anomalous behaviour of FIFO.	Understand	2
4	**Define** thrashing? Explain the different methods to avoid thrashing.	Knowledge	2
5	**Explain** about addresses binding for a user program and discussmulti step processing of a user program?	Understand	2
6	**State** and explain about Virtual memory concept with neat diagram.	Knowledge	6
7	**Explain** how double buffering improves the performance than asingle buffer for I/O?	Understand	6
8	**Explain** the basic concepts of segmentation with neat diagrams?	Understand	7
9	**Differentiate** between logical I/O and device I/O?	Understand	7
10	**Differentiate** between internal and external fragmentation. Whichone occurs in paging scheme?	Understand Understand	6
11	**Discuss** briefly about Swapping concept with necessary Examples.	Understand	7
12	Consider the following page-reference string: 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6 **Calculate** the number ofpage faults would occur for the following replacement algorithms,assuming fram size is 4. Remember that frames are initially empty. e (i)LRU replacement (ii)FIFO replacement (iii)Optimal replacement	Apply	6
13	**Explain** briefly about Paging with neat diagram.	Understand	6
14	**Discuss** LRU-Approximation page replacement?	Understand	6

UNIT – IV			
1	**Discuss** about a. Disk Management b. Swap -Space Management	Understand	7
2	**Describe** the following Directory Implementation methods: a. Linear List b. Hash Table	Knowledge	7
3	**Discuss** the Criteria for choosing file origination?	Understand	7
4	**Define** buffering, caching and spooling.	Knowledge	7
5	**Describe** indexed file, indexed sequential file organization?	Knowledge	7
6	**Explain** the following File concepts: a. File Attributes. b. File Operations. c. File Types. d. Internal File Structure.	Understand	7
7	a. **Discuss** about N- step- SCAN policy for disk scheduling. b. **Explain** how double buffering improves the performancethan a single buffer for I/O.	Understand Understand	7
8	**List** and Explain three Blocking Methods?	Knowledge	7
9	**Explain** shortest Process Next scheduling with an example?	Understand	7
10	**Explain the** relationship between a pathname and a workingdirectory?	Understand	7
11	**Discuss** about N-Step scan policy for disk scheduling?	Understand	7
12	**Discuss** in detail the performances issues of secondary storage management?	Understand	7

13	**Compare** and contrast chained allocation with indexedallocation technique of file allocation	Apply	7
14	**List** the various disk space allocation strategies. Explain clearlythe contiguous allocation technique.	Knowledge	8
15	**Describe** briefly a. The methods of file accessing. b. b. Two level directory structure.	Knowledge	7
16	**Explain** about the protection strategies provided for files. a. Types of access b. Access control list (ACL)	Understand	8

UNIT – V			
1	**Explain** the working of banker‟s algorithm for deadlockavoidance with	Understand	9
	suitable examples.		
2	a. **Explain** the critical section? Describe the different solution	Understand	9
	available to avoid race conditions?		
	b. **Explain** about Mutual exclusion?		
3	**Explain** the Banker‟s algorithm for deadlock avoidance. Deadlock avoidance definition Data structures used Safety algorithm Resource request algorithm	Understand	9
4	**Describe** the access matrix model used for protection.	Understand	11
5	**Relate** the terms race condition, atomic transaction, critical	Apply	9

	section and mutual exclusion.		
6	**Describe** Resource-Allocation graph? Explain how resourcegraph can be used for detecting deadlocks.	Understand	9
7	**Discuss** deadlock detection in detail.	Understand	9
8	**Explain** briefly about resource allocation graph with examples.	Understand	9
9	**State** and explain the methods involved in recovery fromdeadlocks	Knowledge	9
10	**Explain** the conditions for the deadlock to occur? How can adeadlock be prevented?	Understand	9

TUTORIAL QUESTION BANK

Course Title	OPERATING SYSTEMS			
Course Code	2050510			
Regulation	R20			
Course Structure	Lectures	Tutorials	Practicals	Credits
	3	-	-	3
Course Faculty	Md.Praveez, Asst.Prof			

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S. No.	Question	Blooms Taxonomy Level	Course Outcomes
	UNIT – I		
	PART - A (Short Answer Questions)		
1	**Define** operating system?	Knowledge	1
2	**Discuss** batch systems?	Understand	1
3	**List** any four functions of operating system?	Knowledge	1
4	**Define** system call?	Knowledge	1
5	**List** any four types of system calls?	Knowledge	1
6	**Distinguish** between user mode and kernel mode operations of theoperating system?	Understand	1
7	**List** the advantages of multiprogramming?	Knowledge	1
8	**Distinguish** between multiprogramming and multitasking?	Understand	1
9	**Define** interrupt?	Knowledg	1

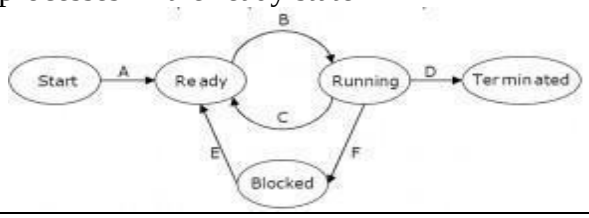
		e	
10	**Define** distributed systems?	Knowledge	1
11	**Define** real-time operating system?	Knowledge	1
12	**Define** virtual machine?	Knowledge	1
13	**List** the memory hierarchy available in operating system?	Knowledge	1
14	**Define** multiprocessor system?	Knowledge	1
15	**Describe** the different types of multiprocessing?	Knowledge	1
16	**Describe** the different types of multiprocessor systems?	Knowledge	1
17	**Define** kernel?	Knowledge	1
18	**Define** time-sharing systems?	Knowledge	1
19	**Describe** the use of fork () and exec () system calls?	Knowledge	1
20	**Define** privileged instructions?	Knowledge	1
21	**State** the differences between system call and system program?	Knowledge	1
22	**State** the five major activities of an operating system in regard to processmanagement?	Knowledge	1
23	**State** the main advantage of the layered approach to system design? Whatare the disadvantages of using the layered approach?	Knowledge	1
24	**List** the contemporary operating systems that use the microkernel approach?	Knowledge	1
25	**List** the various OS components?	Knowledge	1
26	**State** the challenges in designing a distributed operating system?	Knowledge	1
	PART-B (Long Answer Questions)		
1	**State** and explain various types of computer systems?	Knowledge	2
2	a) **Define** an operating system? State and explain the basic functions orservices of an operating system? b) **Explain** the differences between multiprogramming and time-sharingsystems?	Understand	2
3	**Explain** how protection is provided for the hardware resources by theoperating system?	Understand	2
4	**Describe** the system components of an operating system and **explain** thembriefly?	Understand	2
5	**Describe** the operating system structures?	Knowledge	2
6	**Discuss** the following structures of OS?		2
7	**Explain** briefly system calls with examples?	Understand	2
8	**Define** the essential properties of the following operating systems?		2
9	a) **Explain** the architecture of an operating system? b) **Draw** and explain the architecture of windows 2000 and traditionalUNIX?	Understand	2

10	Computer system architecture deals about how the component of a computer system may be organized? **Discuss** in detail about different architectures of a computer system?	Understand	2
11	Does an operating system generally need to keep about running processesin order to execute them? **Explain** in detail.	Understand	2
12	**Discuss** the view of an operating system as a resource manager?	Understand	2
13	**Distinguish** between multiprogramming, multitasking and multiprocessing?	Understand	2
14	**Explain** how operating system services are provided by system calls?	Understand	2
15	**Describe** the functionalities listed below? a) Batch programming b) Virtual Memory c) Time sharing	Knowledge	2
16	**Distinguish** between the client-server and peer-to-peer models ofdistributed systems?	Understand	2
	PART-C (Problem Solving and Critical Thinking)		
1	How does the distinction between kernel mode and user mode function as a rudimentary form of protection (security) system? **Justify.**	Apply	1
2	**Explain** using a simple system call as an example (e.g. getpid, or uptime), what is generally involved in providing the result, from the point of calling the function in the C library to the point where that function returns?	Understand	1
3	In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems? a) **Explain** two such problems? b) Can we ensure the same degree of security in a time-shared machine as we have in a dedicated machine? **Explain** your answer.	Apply	1
4	**Explain** why must the operating system be more careful when accessing input to a system call (or producing the result) when the data is inmemoryinstead of registers?	Understand	1
5	**Discuss** how a multi-threaded application can be supported by a user- level threads package. It may be helpful to consider (and draw) the components of such a package, and the function theyperform?	Understand	1
6	**Explain** why do you think that idleness in CPU occurs?	Knowledge	1
7	**Explain** If you run the same program twice, what section would be shared in the memory?	Knowledge	1
8	**Explain** the difference between interrupt and exception?	Understand	1
9	**Differentiate** between tightly coupled systems and loosely coupled systems.	Apply	1
10	**Explain** Is OS is a resource manager? If so justify your answer	Knowledge	1
	UNIT – II		
	PART - A (Short Answer Questions)		
1	**Define** process. what is the information maintained in a PCB?	Knowledge	2
2	**Define** process state and mention the various states of a process?	Knowledge	2

3	**Describe** context switching?	Knowledge	2
4	**Explain** the use of job queues, ready queues and device queues?	Understand	2
5	**Distinguish** between thread with process?	Understand	2
6	**Explain** benefits of multithreaded programming?	Understand	2
7	**Explain** different ways in which a thread can be cancelled?	Understand	2
8	**Distinguish** between user threads and kernel threads?	Understand	2
9	**Define** CPU scheduling?	Knowledge	2
10	**List** the various scheduling criteria for CPU scheduling?	Knowledge	2
11	**Distinguish** between preemptive and non-preemptive scheduling techniques?	Understand	2
12	**Define** turnaround time?	Knowledge	3
13	**List** different types of scheduling algorithms?	Knowledge	1
14	**State** critical section problem?	Knowledge	1
15	**State** the requirements that a solution to the critical section problem must satisfy?	Knowledge	1
16	**Define** race condition?	Knowledge	2
17	**Define** semaphores. Mention its importance in operating system?	Knowledge	2
18	**State** two hardware instructions and their definitions which can be used for implementing mutual exclusion?	Knowledge	2
19	**Explain** bounded waiting in critical region?	Understand	2
20	**Distinguish** between semaphore and binary semaphore?	Understand	1
21	**Define** monitor?	Knowledge	1
22	**Describe** entry and exit sections of a critical section?	Knowledge	1
23	**State** the real difficulty with the implementation of the SJF CPU scheduling algorithm?	Knowledge	1
24	**State** the factors on which the performance of the Round Robin CPU scheduling algorithm depends?	Knowledge	2
25	**Name** the algorithms used for foreground and background queue scheduling in a multilevel queue-scheduling algorithm?	Knowledge	2
26	**State** the assumption behind the bounded buffer producer consumer problem?	Knowledge	2
PART-B (Long Answer Questions)			
1	**Explain** the reasons for process termination?	Understand	1
2	**Discuss** the following process, program, process state, process control	Understand	1
3	**Explain** the process state transition diagram with examples.	Understand	1

4	**Discuss** the attributes of the process. **Describe** the typical elements ofprocess control block?	Understand	1
5	**Explain** the principles of concurrency and the execution of concurrentprocesses with a simple example?	Understand	2
6	**Describe** dining-philosophers problem? Device an algorithm to solve theproblem using semaphores?	Understand	2
7	**Explain** the infinite buffer producer/consumer problem for concurrentprocessing which uses binary semaphores?	Understand	2
8	Define monitor? Distinguish between monitor and semaphore. **Explain** indetail a monitor with notify and broadcast functions using an example?	Understand	2
9	List out the various process states and briefly **explain** the same with a statediagram?	Understand	1
10	a) Describe process scheduling? **Explain** the various levels ofscheduling. b) **Distinguish** pre-emptive and non-pre-emptive schedulingalgorithms?	Understand	1
11	**Discuss** about following? a) Process b) Components of process c) Program versus process d) Process states	Understand	1
12	**Discuss** the following? a) CPU-I/O burst cycle b) CPU schedule c) Pre-emptive and non-preemptive scheduling d) Dispatcher	Understand	2
13	**Explain** the concept of multi-threading? Discuss the following multi-threading models. a) Many-to-one b) One-to-one c) Many-to-many d) Two-level	Understand	1
14	**Explain** the issues that may rise in multi-threading programming. Discussabout each in detail?	Understand	1
15	**Discuss** the following CPU scheduling algorithms a) Round robin b) Multilevel- queue scheduling c) Multi-level feedback queue scheduling	Understand	1
16	A scheduling mechanism should consider various scheduling criteria torealize the scheduling objectives? **List** out all the criteria.	Knowledge	2
17	Define semaphore? **Explain** the method of application of semaphore forprocess synchronization?	Understand	3
18	**Explain** the Readers and Writers problem and its solution using theconcept of semaphores?	Understand	2
19	**Explain** the uses of the following: a. Mutex object b. Semaphore object c. Waitable timer object	Understand	2
20	**Write** short notes about the following: a. Binary Semaphores b. Bounded Waiting	Knowledge	2
PART-C (Problem Solving and Critical Thinking)			

<table>
<tr><td>1</td><td>Suppose we have a single processor system, and jobs arrive at a rate of 10 jobs a Seconds, suppose each job takes an average of 50 milli-seconds to complete. Assure that both distributions are exponential. State the expected number of jobs in the system and the average time in the system?</td><td>Apply</td><td>1</td></tr>
<tr><td>2</td><td>Suppose the following jobs arrive for processing at the times indicated, each job will run the listed amount of time.
Jobs Arrival Time Burst Time (in secs)
1 0.0 8
2 0.4 4
3 1.0 1
Give Gantt chart illustrating the execution of these jobs using the non- pre-emptive FCFS and SJF scheduling algorithms. Compute the average turnaround time and average waiting time of each job for above algorithms.</td><td>Apply</td><td>1</td></tr>
<tr><td>3</td><td>Consider system with five processor P0 to P4 and 3 resources A, B and C, Resources type A has 10 instances, B has 5 instances and C has 7 instances. The snapshot at time T0 is
<table><tr><th></th><th colspan="3">ALLOTED</th><th colspan="3">MAX</th></tr><tr><th></th><th>A</th><th>B</th><th>C</th><th>A</th><th>B</th><th>C</th></tr><tr><td>P0</td><td>0</td><td>1</td><td>0</td><td>7</td><td>5</td><td>3</td></tr><tr><td>P1</td><td>2</td><td>0</td><td>0</td><td>3</td><td>2</td><td>2</td></tr><tr><td>P2</td><td>3</td><td>0</td><td>2</td><td>9</td><td>0</td><td>2</td></tr><tr><td>P3</td><td>2</td><td>1</td><td>1</td><td>2</td><td>2</td><td>2</td></tr><tr><td>P4</td><td>0</td><td>0</td><td>2</td><td>4</td><td>3</td><td>3</td></tr></table>Now the process P1 request one additional resource type A and two instances of C. Determine whether this new site is safe or not.</td><td>Apply</td><td>1</td></tr>
<tr><td>4</td><td>Explain the advantage of using semaphores over Test And Set () and Swap() functions. Describe the use of wait() and signal() functions on semaphore and how these can provide the solution to the Critical section problem?</td><td>Understand</td><td>1</td></tr>
</table>

5	**Consider** the following set of processes with the length of the CPU bursttime given in milliseconds Process BurstTime Priority P1 10 3 P2 1 1 P3 2 3 P4 1 4 P5 5 2 The processes are assumed to have arrived in the order p1, p2, p3, p4, p5all at time 0. a) Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, anon pre-emptive priority (a smaller priority number implies a higher priority) and RR (quantum=1) scheduling. b) What is the turnaround time of each process for each of thescheduling algorithms in part? c) What is the waiting time of each process for each of the schedulingalgorithms in part? Which of the schedules in part a results in the minimal average waiting time?	Apply	1
6	**Consider** three processes (process id 0, 1, 2 respectively) with compute time bursts 2, 4 and 8 time units. All processes arrive at time zero. Consider the longest remaining time first (LRTF) scheduling algorithm. In LRTF ties are broken by giving priority to the process with the lowest process id. The average turnaround time is?	Apply	2
7	**Consider** three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6, respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end	Apply	2
8	**Explain** the following process state transition diagram for a uniprocessorsystem, assume that there are always some processes in the ready state 	Understand	2
9	**Explain** Four jobs to be executed on a single processor system arrive attime 0 in the order A, B, C, D. their burst CPU time requirements are 4, 1, 8, 1 time units respectively. The completion time of A under roundrobin scheduling with time slice of one time unit is?	Apply	3
10	**Explain** Which scheduling algorithm allocates the CPU first to the process that requests the CPU first?	Understand	3
	UNIT – III		
	PART - A (Short Answer Questions)		
1	**Explain** the main function of the memory-management unit?	Understand	2
2	**Distinguish** between logical address and physical address?	Understa	2

		nd	
3	**Describe** dynamic loading and dynamic linking?	Knowledge	2
4	**Distinguish** between compile time, load time and execution time address binding?	Understand	2
5	**Define** swapping?	Knowledge	2
6	**List** dynamic storage allocation strategies in contiguous memory allocation scheme?	Knowledge	2
7	**Distinguish** between MFT and MVT?	Understand	2
8	**Distinguish** between internal and external fragmentation?	Understand	3
9	**Define** compaction?	Knowledge	3
10	**List** and define non-contiguous memory allocation schemes?	Knowledge	3
11	**Distinguish** between paging and segmentation?	Understand	3
12	**State** the purpose of TLB?	Knowledge	2
13	**Explain** the basic approach of page replacement?	Understand	2
14	**Distinguish** between page table and inverted page table?	Understand	2
15	**State** the benefits of a virtual memory system?	Knowledge	2
16	**Distinguish** between demand paging and pure demand paging?	Understand	3
17	**Explain** the calculation of effective access time of a demand-paged memory system?	Understand	3
18	**Explain** page fault and its effect on the performance of the demand paged memory system?	Understand	3
19	**Explain** the need for page-replacement.?	Understand	1
20	**List** various page replacement algorithms?	Knowledge	1
21	**Distinguish** between local and global page replacement strategies?	Understand	1
22	**Distinguish** between equal and proportional frame allocation strategies?	Understand	2
23	**Explain** the concept of thrashing and why thrashing should be avoided in a system?	Understand	2
PART-B (Long Answer Questions)			

1	**Describe** the following? a) Virtual Memory b) Cache Memory c) Auxiliary Memory	Understand	1
2	**Explain** in detail the requirements that memory management technique needs to satisfy?	Understand	1
3	**Explain** a) Paging b) Page table structure c) Translation look-aside buffer d) Segmentation	Understand	2
4	**Explain** why the "principle of locality" is crucial to the use of virtual memory? What is accomplished by page buffering?	Understand	2
5	**Discuss** briefly the swapping concept with necessary examples?	Understand	1
6	**Describe** contiguous memory allocation concept with advantages and disadvantages?	Knowledge	1
7	**Differentiate** the main memory organization schemes of contiguous- memory allocation, segmentation, and paging with respect to the following		2
8	**Differentiate** between internal and external fragmentation and Which one occurs in paging scheme?	Understand	3
9	**Explain** briefly about paging with neat diagram?	Understand	1
10	**Discuss** the following a) Hierarchical paging b) Inverted page Tables	Understand	1
11	Draw and **explain** the working procedure of paging hardware in detail?	Understand	1
12	**Explain** the basic concepts of segmentation with neat diagrams?	Understand	1
13	**Define** page fault? When does a page fault occur? Describe the action taken by OS when page fault occurs?	Knowledge	2
14	**State** and explain about virtual memory concept with neat diagram?	Knowledge	2
15	**Differentiate** between paging and segmentation?	Understand	2
16	**Explain** briefly the performance of demand paging with necessary examples?	Understand	2
17	**Explain** the basic Scheme of page replacement and about the various page replacement strategies with examples?	Understand	3
18	**Explain** the Readers and Writers problem and its solution using the concept of semaphores?	Understand	1
19	**Explain** the uses of the following: a. Mutex object b. Semaphore object c. Waitable timer object	Understand	2
20	**Write** short notes about the following: a. Binary Semaphores b. Bounded Waiting	Knowledge	3

21	**Explain** the Readers and Writers problem and its solution using the concept of semaphores?	Understand	2
	PART-C (Problem Solving and Critical Thinking)		
1	Suppose you have 16M bytes of main memory. Using the list method there is an overhead of 8B per memory block. Using the bitmap method, the allocation granularity is of 128B. How many blocks are there when the space overhead of both methods is the same? **Explain** the average block size for this many blocks?	Apply	3
2	**Consider** a computer system supports 32-bit virtual addresses as well as 32-bit physical addresses. Since the virtual address space is of the same size as the physical address space, the operating system designers decide to get rid of the virtual memory entirely.	Apply	4
3	**Consider** a CPU generates 32-bit virtual addresses. The page size is 4 KB. The processor has a translation look-aside buffer (TLB) which can hold a total of 128 page table entries and is 4-way set associative. The minimum size of the TLB tag is:	Apply	2
4	**Consider** there are 3 page frames which are initially empty. If the page reference string is 1, 2, 3, 4, 2, 1, 5, 3, 2, 4, 6, the number of page faults using the optimal replacement policy is	Apply	1
5	**Consider** the following page reference string 7,0,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0 Assuming three frames, how many page faults would occur in each of the following cases? a) LRU b) FIFO c) Optimal algorithms Note that initially all frames are empty.	Apply	1
6	**Analyze** that we have a paging system with page table stored in memory A. If a memory reference takes 200 nanoseconds how long does a paged B. If we add associative registers and 75% of all page table references are memory reference take found in the associative registers, what is the effective memory reference time? Assume that finding a page table entry in the associative registers takes zero time, if the entry is there.	Analyze	2
7	In two level nested loops, the outer index (i) runs from 1 to 5 and the inner index (j) runs from 1 to 10. The page faults seem to occur for every 7^{th} innermost iterations. If it takes 0.02 micro second to load a new page what is the extra time required because of occurrence of page faults?	Apply	2
8	Given memory partitions of 100K, 500K, 200K, 300K, and 600K (in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 212K, 417K, 112K,	Apply	2

	and 426K (in order)? **Explain** Which algorithm makes the most efficient use of memory?		
9	Suppose we have a demand paged memory. The page table is held in registers. It takes 8 milliseconds to service a page fault if an empty frame is available or the replaced page is not modified and 20 milliseconds if thereplaced page is modified. Memory access time is 100 nanoseconds. **Consider** that the page to be replaced is modified 70 percent of the time. What is the maximum acceptable page-fault rate for an effective access time of no more than 200 nanoseconds?	Apply	3
10	**Consider** a logical address space of eight pages of 1024 words eachmapped onto a physical memory of 32 frames a) How many bits are in the logical address? b) How many bits are in the physical address?	Apply	3
	UNIT – IV		
	PART - A (Short Answer Questions)		
1	**Define** the terms – file, file path, directory?	Knowledge	2
2	**Explain** any four common file attributes?	Understand	2
3	**Explain** any four file operations?	Understand	2
4	**Distinguish** between shared and exclusive lock?	Understand	2
5	**List** any four common file types and their extensions?	Knowledge	2
6	**Explain** the information associated with an open file?	Understand	3
7	**List** the different file accessing methods?	Knowledge	3
8	**Explain** the operations that can be performed on a directory?	Understand	4
9	**Discuss** the most common schemes for defining the logical structure of adirectory?	Understand	4
10	**Describe** UFD and MFD.?	Knowledge	4
11	**Describe** file system mounting?	Knowledge	2
12	**Write** the format of a typical file-control block?	Knowledge	3
13	**List** the different disk-space allocation methods?	Knowledge	2
14	**List** the various layers of a file system?	Knowledge	3
15	**Explain** the functions of virtual file system (VFS)?	Understand	3
16	**Describe** about different types of disk scheduling?	Knowledge	3
17	**Define** the terms with respect to disk I/O - seek time, latency time?	Knowledge	3

18	**Explain** the allocation methods of a disk space?	Understand	3
19	**State** the advantages of linked disk-space allocation strategy?	Knowledge	3
20	**State** the advantages of indexed disk-space allocation strategy?	Knowledge	2
21	**List** the different free disk-space management techniques?	Knowledge	2
22	**Explain** the bit vector method free space management on disk?	Understand	2
23	**Discuss** the advantages of contiguous memory allocation of disk space?	Understand	2
24	**Discuss** the drawbacks of contiguous allocation of disk space?	Understand	1
25	**List** any four secondary storage memory devices?	Knowledge	1
26	**Describe** about logical formatting of the disk?	Knowledge	1
27	**List** various disk-scheduling algorithms?	Knowledge	1
28	**State** the purpose of boot block?	Knowledge	2
PART-B (Long Answer Questions)			
1	a) **Discuss** the criteria for choosing a file organization? b) **Describe** indexed file and indexed sequential file organization?	Understand	3
2	**Describe** the file system of UNIX?	Understand	3
3	**List** the common file types along with their extensions and describe each file type?	Knowledge	3
4	**Differentiate** among the following disk scheduling algorithms? a) FCFS b) SSTF c) SCAN d) C-SCAN e) LOOK f) C-LOOK	Understand	2
5	a) **Explain** magnetic disk structure and its management? b) **Exemplify** swap space management?	Understand	1
6	**Explain** the following in detail with respect to disk? a) Seek time b) Latency c) Access time d) Transfer time	Understand	1
7	a) **Explain** in detail the interrupts and interrupt handling features? b) **Explain** with neat diagram the steps in DMA transfer?	Understand	1
8	a) **Discuss** the N-step SCAN policy for disk scheduling? b) **Explain** how double buffering improves the performance than a single buffer for I/O?	Understand	1

9	a) **Explain** the techniques used for performing I/O? b) Give an example of an application in which data in a file should beaccessed in the following order: i. sequential ii. Random	Understand	2
10	**Discuss** in detail the performance issues of secondary storagemanagement?	Understand	2
11	**Explain** how disk caching can improve disk performance?	Understand	2
12	**Explain** low-level formatting or physical formatting?	Understand	2
13	**Define** buffering, caching and spooling?	Knowledge	2
14	**Discuss** the following a) File system mounting b) Thrashing	Understand	2
15	**Explain** the following file concepts: a) File attributes b) File operations c) File types d) Internal file structure	Understand	3
16	**Explain** the concept of file sharing? What are the criteria to be followed insystems which implement file sharing?	Understand	3
17	**Describe** the following Directory Implementation methods? a) Linear List b) Hash Table	Knowledge	3
18	**Explain** the concept and techniques of free space management?	Understand	3
19	**Discuss** about a) Disk space management b) Swap -space management	Understand	3
1	Suppose we have files F1 to F4 in sizes of 7178, 572, 499 and 1195 bytes. Our disks have fixed physical block size of 512 bytes for allocation. **Explain h**ow many physical blocks would be needed to storethese four files if we were to use a chained allocation strategy assuming that we need5 bytes of information to determine the next block in the link? Which fileresults in the maximum internal fragmentation (measured as a percentageof the file size itself)?	Understand	1
2	**Using** a diagram, show how an indexed allocation of a file may be done for a disked based system with the following characteristics. The disc sizeis 30blocks each of 1024 bytes (may be modeled as 6 X 5 matrixes). File f1 is 11 logical records of 112 bytes, file f2 is 890 logical records of 13 bytes, file f3 is 510 bytes of binary data stream and file f4 is 4 logical blocks of 95 bytes.	Apply	2
3	A hard disk has 63 sectors per tracks, 10 platters each with 2 recording surfaces and 1000 cylinders. The address of a sector is given as a triple <c, h, and s> where c is the cylinder number, h is the surface number and s is the sector number. Thus 0th sector is	Understand	2

	addressed as <0, 0, and 0>, the 1st sector is Addressed as <0, 0, and 1> and so on. Calculate the address of 1050th sector.		
4	**Explain** the maximum file size supported by a file system with 16 direct blocks, single, double, and triple indirection? The block size is 512 bytes. Disk block numbers can be stored in 4 bytes.	Understand	2
5	**Discuss** the reasons why the operating system might require accurate information on how blocks are stored on disk. how could operating system improves file system performance with this knowledge	Understand	2
6	**Discuss** how OS could maintain a free-space list for a tape-resident file system. Assume that the tape technology is append-only and that it uses EOT marks and locate, space and read position command	Understand	2
7	Is there any way to implement truly stable storage? **Explain** your answer	Understand	2

8	Could a RAID level 1 organization achieve better performance for read requests than RAID level 0 organization(with non redundant striping of data)? If so, how?	Understand	1
9	Compare the performance of write operations achieved by a RAID level 5 organization with that achieved by a RAID level 1 organization.	Understand	2
10	**Consider** that a disk drive has 5,000 cylinders, numbered 0 to 4,999. The drive is currently serving request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is: 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130 Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all pending requests for each of the following disk scheduling algorithms? A. FCFS B. SSTF C. SCAN D. C-SCAN E. LOOK F. C-LOOK	Apply	2
	UNIT – V		
	PART - A (Short Answer Questions)		
1	**Define** deadlock?	Knowledge	1
2	**Define** resource. List some resources that a process might need for its execution?	Knowledge	1
3	**Explain** the sequence in which a process may utilize the resources in normal mode of operation?	Understand	1
4	**Describe** the conditions under which a deadlock situation may arise?	Knowledge	1

5	**Explain** safe state and unsafe state?	Understand	2
6	**Describe** the representation of a resource-allocation graph?	Knowledge	2
7	**Distinguish** between deadlock avoidance and prevention strategies?	Understand	2
8	**Describe** the purpose of banker‟s algorithm?	Knowledge	2
9	**List** the four data structures (matrices) that must be maintainedto implement banker‟s algorithm?	Knowledge	2
10	**Describe** the techniques for recovery from deadlock?	Knowledge	3
11	**List** the goals of protection?	Knowledge	3
12	**Define** the terms – object, domain, access right?	Knowledge	3
13	**Write** the format of an access matrix?	Knowledge	3
14	**List** the implementation techniques of access matrix?	Knowledge	3
15	**Describe** role-based access control?	Knowledge	3
16	**List** the schemes that implement revocation of capabilities?	Knowledge	4
17	**List** any two example systems that implement capability-based protection?	Knowledge	4
18	**Describe** any one language-based protection schemes.	Knowledge	1
19	**Write** the main differences between capability lists and access lists?	Knowledge	1
20	**State** the protection problems that may arise if a shared stack is usedfor parameter passing?	Knowledge	1
21	**State** principle of least privilege?	Knowledge	1
PART-B (Long Answer Questions)			
1	**Define** deadlock? what are the four conditions necessary for a deadlocksituation to arise? how it can be prevented?	Knowledge	2
2	**Explain** briefly resource allocation graph with examples?	Understand	2
3	**Differentiate** the deadlock handling methods?	Understand	2
4	**Discuss** in detail the technique of deadlock avoidance?	Understand	2

5	**Explain** Banker‟s algorithm for deadlock avoidance with an example?	Understand	3
6	**Discuss** deadlock detection method in detail?	Understand	3
7	**State** and explain the methods involved in recovery from deadlocks?	Knowledge	3
8	Describe resource-allocation graph? **Explain** how resource graph can beused for detecting deadlocks?	Understand	4
9	**Describe** the terms. a) Race condition b) Atomic transaction c) Critical section d) Mutual exclusion	Knowledge	4
10	**Describe** how the access matrix facility and role-based access controlfacility are similar? how do they differ?	Knowledge	4
11	**Explain** why a capability based system such as Hydra provides greaterflexibility than the ring- protection scheme in enforcing protection policies?	Understand	4
12	**Explain** the following. a) Goals of protection b) Principles of protection	Understand	4
13	**Discuss** about domain of protection?	Understand	4
14	Why do you need to provide protection to the system? **Explain** how accessmatrix can be used for the purpose?	Understand	4
15	**Discuss** the access matrix implementation techniques?	Understand	3
16	**Compare** the various access matrix implementation techniques?	Understand	3
17	**Discuss** the various issues that need to be considered through the processof revocation of access rights?	Understand	2
18	**Explain** various schemes to implement revocation for capabilities?	Understand	2
19	**Explain** how language-based protection scheme can be used forproviding system protection at kernel level?	Understand	1
20	**Explain** relative merits of compiler-based enforcement based solely on akernel, as opposed to enforcement provided largely by a compiler?	Understand	1
PART-C (Problem Solving and Critical Thinking)			
1	**Consider** the following snapshot of a system Answer the following questions using the banker‟s algorithm: a) What is the content of matrix “Need”? b) Is the system in a safe state? c) If a request from process P1 arrives for (0, 4, 2, 0) can the request begranted immediately?	Apply	1

2	**Consider** the version of the dining-philosophers problem in which the chopsticks are placed at the center of the table and any two of them can beused by a philosopher. Assume that requests for chopsticks are made oneat a time. Describe a simple rule for determining whether a particular request can be satisfied without causing deadlock given the currentallocation of chopsticks to philosophers.	Analyze	1
3	**Consider** a system consisting of *m* resources of the same type being shared by *n* processes. A process can request or release only one resource at a time. Show that the system is deadlock free if the followingtwo conditions hold: a) The maximum need of each process is between one resource and *m* resources. *b)* The sum of all maximum needs is less than *m + n.*	Analyze	1

4	**Explain** How does the principle of least privilege aid in thecreation of protection systems?	Analyze	2
5	**Describe** how the Java protection model would be compromised if a Java program were allowed to directly alter the annotations of its stack frame.	Analyze	2
6	**List** the Coffman's conditions that lead to a deadlock**.**	Understand	2

7	A system has n resources $R_0,...,R_{n-1}$,and k processes $P_0,.....P_{k-1}$.The implementation of the resource request logic of each process P_i is asfollows:
	`if (i % 2 == 0)`
	`{`
	`if (i < n) request Ri`
	`if (i+2 < n) request Ri+2`
		Analyze	2

8	A system contains three programs and each requires three tape units for its operation. **Explain** the minimum number of tape units which the systemmust have such that deadlocks never arise is?	Analyze	2
9	A system has 6 identical resources and N processes competing for them. Each process can request atmost 2 resources. **Explain** which one of the following values of N could lead to a deadlock?	Analyze	2

10	Two shared resources R_1 and R_2 are used by processes P1 and P2. Each process has a certain priority for accessing each resource. Let T_{ij} denote the priority of P_i for accessing R_j. A process P_i can snatch a resource R_h from process P_j if T_{ik} is greater than T_{jk}. Given the following : 1. $T_{11} > T_{21}$ 2. $T_{12} > T_{22}$ 3. $T_{11} < T_{21}$ 4. $T_{12} < T_{22}$ **Explain** which of the following conditions ensures that P1 and P2 can never deadlock?	Analyze	3

MARRI LAXMAN REDDY
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COMPUTER SCIENCE AND ENGINEERING

COURSE DESCRIPTION FORM

Course Title	**INTELLECTUAL PROPERTY RIGHTS**			
Course Code	**2020024**			
Regulation	**R20**			
Course Structure	**Lectures**	**Tutorials**	**Practical**	**Credits**
	2	-	-	2
Course Faculty	Feroz Khan, Asst.Prof			

I. COURSE OVERVIEW:

This course introduces the importance of intellectual property and the protection of creation or innovationor ideas which are to be used to make a product or service or design layout or process which is economical calledpatents, utilities etc. The course emphasizes on intellectual property protection and its importance of estimating theintelligence of an individual correlates with financial advantages. It also deals with fundamentals of laws to protect and encourage the inventions and creations. The main objective of this course is to examine the laws and the procedures to protect the intellectual property rights of an intellectual or expert and make it like another property which is non tangible. This course is presented to students by power point projections, lecture notes, course handouts, assignments, objective and subjective tests.

II. PREREQUISITE(S):

Level	Credits	Periods / Week	Prerequisites
UG	-	2	-

III. MARKS DISTRIBUTION:

Sessional Marks (25 Marks)	University End Exam Marks	Total Marks

Mid Semester Test There shall be two midterm examinations. Each midterm examination consists of essay paper. The essay paper is for 25 marks of 90 minutes duration and shall contain PART-A and PART-B. PART-A of 10 marks, It consists 10 questions student has to answer all questions each carries 1 Mark, PART-B of 15 marks, It contains 3 questions with internal choice, each question carries 5 marks.	70	100

IV EVALUATION SCHEME:

Mid Semester Test	30 marks
End Semester Examination	70 arks

V COURSE OBJECTIVES:

At the end of the course, the student will be able to:

1. Be familiar with different types of Intellectual Property (IP)
2. Be familiar with the Rights of Ownership
3. Be familiar with procedures of evaluation, registration, protection and acquisition of trademarks
4. Be familiar with Law of Intellectual Property
5. Explore knowledge in Trademarks, Copyrights, Patents and Trade Secrets
6. Adequate knowledge in New Developments in IP
7. Be familiar with auditing and advantages

IV. COURSE OUTCOMES:

At the end of the course the student will develop ability to

CO	Course outcome	Blooms taxonomy level
C319.1	Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.	Apply
C319.2	Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.	Understand
C319.3	Identify activities and constitute IP infringements and the remedies available to the IP owner to prevent infringement of proprietary rights in products and technology development.	Understand
C319.4	Identify critical analysis arguments relating to the development and reform of intellectual property right institutions	Evaluate

C319.5	Demonstrate a capacity to identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing	Understand

v. HOW COURSE OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by
PO1	**Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specializationto the solution of complex engineering problems	H	Assignments
PO2	**Problem Analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	H	Assignments
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes thatmeet t he specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	**S**	Mini Projects
PO4	**Conduct investigations of complex problems**: Use research-basedknowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the informationto provide valid conclusions	H	Designing,Exercises
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	S	Designing .
PO6	**The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to theprofessional engineering practice	N	--
PO7	**Environment and sustainability**: Understand the impact of theprofessional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need forsustainable development	N	--
PO8	**Ethics**: Apply ethical principles and commit to professional ethicsand responsibilities and norms of the engineering practice	S	PrototypeModels

PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings	N	--
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	S	Document Preparation, Presentation
PO11	**Project Management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one"s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments	S	Assignments
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change	H	Assignments

N = None **S = Supportive** **H = Highly Related**

SYLLABUS:

UNIT – I
INTRODUCTION TO INTELLECTUAL PROPERTY:
Introduction, Types of Intellectual Property (IP), International Organizations, Agencies and treaties, Importance of Intellectual Property Rights.

UNIT - II
TRADE MARKS:
Purpose and Function of Trademarks, Acquisition of Trademarks Rights, Protectable Matter, Selecting and Evaluating Trademark, Trademark Registration Processes

UNIT - III
LAW OF COPYRIGHTS:
Fundamentals of Copyrights Law, Originality of Material, Rights to Reproduction, Rights to Perform the Work Publicly, Copyright Ownership issues, Copyright Registration, Notice of Copyright, International Copyright Law.**LAW OF PATENTS:**
Foundation of Patent Law, Patent searching Process, Ownership Rights and transfer

UNIT - IV
TRADE SECRETS:
Trade Secrets Law, Determination of trade Secrets Status, Liability for misappropriations of Trade Secrets,Protection for submission, Trade Secrets Litigation

UNFAIR COMPETITION: Misappropriation of Right of Publicly, False Advertising

UNIT – V
NEW DEVELOPMENTS OF INTELLECTUAL PROPERTY:
New Developments in Trade Law, Copyright Law, Patent Law, Intellectual Propety Audits International overview of Intellectual Property, International-Trademark Law, Copyright Law, International PatentLaw, International Development in Trade Secrets Law

TEXT BOOKS:

1. Deborah.E.Bouchoux, "Intellectual Property Right", Cengage Learning
2. Prabuddha Ganguli, "Intellectual Property Right", Unleashing the knowledge economy", Tata Mc.Graw HillPublishing Company Ltd.

COURSE PLAN:

At the end of the course, the students are able to achieve the following course learning outcomes:

Lecture No.	CLO	Unit	Course Learning Outcomes	Topics to be covered	Reference
1-5	1	I	**Describe** different types ofIntellectual Property	Introduction of Intellectual Property(IP), Types of IP	T1:1.1, T1:1.2
6-8	2		**Describe** the organizations	International Organizations	T1:1.4
9-11	3		**List** Agencies and treaties related to IntellectualProperty	Agencies and Treaties	T1:1.4
12-13	4		**Understand** the differentLaws in IP	Importance of Intellectual PropertyRights	T1:1.5
14-16	5	II	**Understand** the purpose and function of trademarks	Purpose and function of Trademarks	T1:2.2
17-20	6		**Describe** acquisition oftrademark rights and protectable matter	Acquisition of Trademarks Rightsand Protectable Matter	T1:2.4, 2.9
21-23	7		**Describe** the evaluation of trademark and its selection	Selecting and Evaluating Trade Mark	T1:3.1

Lecture No.	CLO	Unit	Course Learning Outcomes	Topics to be covered	Reference
24-26	8		**Elevate** trademark Registration Processes	Trademark Registration Processes	T1:4.5
27-30	9	III	**Understand** fundamentals of Copyright Law	Fundamentals of Copyright Law	T1:10.2
31-32	10		**Understand** Originality of material and rights of reproduction	Originality of material and rights of Reproduction	T1:11.2
33-36	11		**Explain** the rights to perform the work publicly, copyright ownership and copyright registration	The Rights to perform the work publicly, Copyright ownership issues and Copyright registration	T1:11.5, T1:12.1, T1:13.4
37-40	12		**Know** International Copyright law and notice of copyright	Notice of copyright, International Copyright Law	T1:16
41-43	13		**Explain** the foundation of patent law	Foundation of patent Law	T1:17
44-46	14		**Explain** the patent searching process	Patent Searching Process	T1:18.1
47-48	15		**Learn** patent ownership rights and transfer	Ownership Rights and Transfer	T1:19
49-50	16	IV	**Describe** Trade Secret Law and determine trade secret status	Trade Secrets Law, Determination of Trade Secrets status	T1:2.1, T1:2.3, T1:22.2
51-53	17		**Identify** liability for misappropriation of trade secrets	Liability for misappropriations of Trade Secrets	T1:22.2
54-56	18		**Identify** trade secrets litigation	Protection for submission, trade secrets Litigation	T1:22.5, T1:22.8
57-59	19		**Describe** misappropriation right of publicity	Unfair Competition: Misappropriation of right of publicly	T1:23
60-63	20		Identify False advertising	False advertising	T1:23.3
64-65	21		**Describe** new developments in Trade Law	New developments in Trade Law	T1:7

66-67	22		**Describe** new developments in Copyrightlaw	New developments in Copyright Law	T1:8
68-69	23		**Describe** new developments in patent law	New developments in Patent Law	T1:15.7
70-71	24	**V**	**Understand** IP audits	Intellectual Property Audits	T1:16
72-73	25		**Understand** InternationalOverview of IP	International Overview of IP	T1:21.1,2
74-75	26		**Understand** InternationalTrademark Law	International Trademark Law	T1:21.1, 2
76-77	27		**Understand** InternationalCopyright law	International Copy right Law	T1:24.2
78-79	28		**Understand** InternationalPatent Law	International patent Law	T1:24.2
80-83	29		**Understand** InternationalTrade Secrets Law	International Development in TradeSecrets Law	T1:24.2

MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAMME OUTCOMESAND PROGRAM SPECIFIC OUTCOMES:

Program outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO 1**	**PSO 2**	**PSO 3**
C319.1	0	0	0	0	0	3	3	3	0	3	1	0	2	0	2
C319.2	0	0	0	0	0	3	3	3	0	3	1	0	2	0	2
C319.3	0	0	0	0	0	3	3	3	0	3	1	0	2	0	2
C319.4	0	0	0	0	0	3	3	3	0	3	1	0	2	0	2
C319.5	0	0	0	0	0	3	0	3	0	3	1	0	2	0	2
Average	**0**	**0**	**0**	**0**	**0**	**3**	**3**	**3**	**0**	**3**	**1**	**0**	**2**	**0**	**2**

COMPUTER SCIENCE AND ENGINEERINGASSIGNMENT

Course Name	**INTELLECTUAL PROPERTY RIGHTS**
Course Code	**2020024**
Class	III B. Tech I Semester
Branch	Computer Science and Engineering
Year	2020 – 2021
Course Faculty	Feroz Khan, Asst.Prof

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principalmeans of quality assurance in higher education. The major emphasis of accreditationprocess is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner‟s learning process.

ASSIGNMENT-I

S. No	Question	Blooms Taxonomy Level	Course Outcome
	UNIT-I		
1	**Explain** different types of intellectual property in detail?	Understand	1
2	**Explain** the functions of international intellectual propertyorganizations?	Understand	1
3	**Explain** the agencies and treaties of intellectual property?	Understand	8
4	**Describe** the importance of intellectual property rights?	Knowledge	4
5	**Describe** about IPR? Do you think this is useful rights for us?Explain	Knowledge	4
6	**Explain** about International Organizations, Agencies, and Treaties?	Understand	4
7	**Discuss** whether the following items would be protectable astrademarks, copyrights, patents, or trade secrets: „Freeze You" as the name ofa new type of ice cream a company"s plans for its future business operations and possiblemergers a new type of rose a new slogan to be used by Burger Kinga new novel by Toni Morrison	Understand	4
8	**Distinguish** between Trademark and Trade secrets.	Understand	4
9	**Explain** why agencies responsible for Intellectual PropertyRegistration with any two examples?	Understand	1
10	**Describe** the importance of International organisation? When itwas established?	Knowledge	1
S. No	**Question**	**Blooms Taxonomy Level**	**Course Outcome**
	UNIT – II		
1	**Explain** acquisition of trademark rights?	Understand	4
2	**Write** the procedure for Selecting and evaluating of trademark?	Apply	4
3	**Discuss** the functions of trademark?	Understand	1
4	**Describe** Protectable matter?	Knowledge	1
5	**Explain** trademark registration processes?	Understand	3
6	**Discuss** the method of protecting the prior-used trademarks in thesystem of acquisition-through-registration?	Understand	3
7	**Explain** the reasons for protecting trademarks in the system ofacquisition?	Understand	5
8	**Discuss** new developments in Trademark Law? How do you avoidcyberspace trademark issues?	Understand	2
9	**Explain** how do you select and evaluate Trademark?	Understand	1

10	**Explain** about the process of Trademark?	Understand	1
	UNIT – III		
1	**Explain** about copyright Law and when it was founded?	Apply	6
2	**Discuss** about the Rights under the 1976 copyright act?	Understand	5
3	**Explain** the subject matter of copyright?	Understand	9
4	**Explain** the fundamental of Copyright Law?	Understand	8
5	**Define** the originality of material and how it is identified?	Knowledge	5
6	**Explain** the rights afforded by copyright law?	Understand	9
7	**Discuss** the rights of reproduction?	Understand	9
8	**Discuss** about "the rights to perform the work publicly" and explain it.	Understand	5
9	**Explain** copyright ownership issues?	Understand	9
10	**Explain** when the terminations of transfers of copyrights takeplace?	Understand	8

ASSIGNMENT-II

S. No	Question	Blooms Taxonomy Level	Course Outcome
	UNIT – III		
1	**Explain** how the ownership rights and transfers are taken place?	Understand	5
2	**Write** about the notice of copy right.	Apply	8
3	**Describe** about copy rights.	Knowledge	5
4	**Explain** how the patent searching process is taken place?	Understand	9
5	**Discuss** about copy rights.	Understand	9
6	**What** did you understand about Law of patents?	Understand	8
7	**Write** about the procedure for „the notice of the copy right" isprepared.	Apply	7
8	**Define** the rights of ownership issues.	Knowledge	9
9	**Write** surplusage in Copyright Notice.	Apply	9
10	**Describe** the procedure restoration of Copyright is done.	Knowledge	8
	UNIT – IV		
1	**Define** Trade Secrets Law? Explain about Trade Secrets Law.	Knowledge	13
2	**Explain** the liability for misappropriation of trade secrets?	Understand	11
3	**Illustrate** Trade Secret Litigation.	Understand	10
4	**Discuss** about trade secret protection programs. Explain?	Understand	10
5	**Write** about new development in International trade secrets law. What are they?	Apply	9
6	**Explain** about unfair competition? Write its types?	Understand	9
7	**Discuss** right of publicity. Explain?	Understand	9
8	**Discuss** Misappropriation in Trade Secrets and how the Right ofPublicity help in misappropriation?	Understand	9
9	**Discuss** whether the New Developments in the Right of Publicity isnecessary, if so in what way.	Understand	9
10	**Explain** false advertising with examples?	Understand	8
	UNIT – V		
1	**Explain** about the new developments in Trademark law?	Understand	12

2	**Discuss** how you protect a domain name. Explain theprecautionary steps to be taken for protecting domain name in trademark?	Understand	12
3	**Explain** how the cyber crime can control in trademark? How youhyperlink?	Understand	12
4	**Explain** cybersquatters and the Anticybersquatting consumerProtection Act?	Understand	12
5	**Discuss** new development in protecting copyright law. What arethey? Explain?	Understand	12
6	**Explain** how a copyright protection is overcoming the cybercrime?	Understand	12
7	Describe about copyright protection act? How the copyrightprotection for automated database is processed?	Knowledge	13
8	**Explain** copyright in the electronic age?	Understand	11
9	**Describe** the digital millennium copyright act?	Knowledge	13
10	**Explain** the new developments in copyright and rece ntdevelopments in copyright law?	Understand	13

TUTORIAL QUESTION BANK

Course Name	**INTELLECTUAL PROPERTY RIGHTS**
Course Code	**2020024**
Class	III B.Tech I Semester
Branch	Computer Science and Engineering
Year	2020-21
Course Faculty	Feroz Khan, Asst.Prof

OBJECTIVES

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S.No	Questions	Blooms Taxonomy Level	Course Outcome
	UNIT – I		
	PART - A (SHORT ANSWER QUESTIONS)		
1	**Define** intellectual property?	Knowledge	1
2	**Discuss** intellectual property rights?	Understand	1
3	**Discuss** condition of purchase a book and make photocopies of it and sell, Is itviolation?	Understand	8
4	**Explain** with an example of why intellectual properties need to be protected?	Understand	4
5	**Describe** how monopoly nature of owner is controlled by Patent TrademarkOrganization?	Knowledge	4
6	**Describe** how long will patent protections for the invention for which applicationwas filed on August 10 and patent was issued on January 28, 2003 last?	Knowledge	4
7	**Explain** how long will the copy right last if a novel written by Moby Dick in 1851and died in 1891?	Understand	4
8	**Explain** how long will protections for the song composed by bala in1982 last?	Understand	4
9	**Define** trademark?	Knowledge	1
10	**Define** service mark?	Knowledge	1
11	**Explain** united states trademark law from which time trademark is considered?	Understand	3

12	**Explain** the time validity for registered trademark?	Understand	3
13	**Explain** the additional period of protection with trademark renewal?	Understand	5
14	**Discuss** the protection time period for utility and plant patents?	Understand	2
15	**Explain** the protection time period for design patents?	Understand	11
16	**Define** Trade Secrets?	Knowledge	13
17	**Explain** which type of IPR is preferable for a Jewellery design item; design patentor copyright?	Understand	11
18	**Explain** significant changes to US intellectual property law from General Agreement on Tariffs and Trade (GATT)?	Apply	3
19	**Explain** the functions of united nations agency for promoting Intellectualproperty?	Understand	12
20	**Explain** Paris Convention?	Understand	4
21	**Write** a short note on Berne Convention?	Apply	4
22	**Explain** Madrid Protocol?	Understand	12
23	**Write** the duties of NAFTA?	Apply	4
24	**Define** Trademark?	Understand	12
25	**Write** the importance of IP?	Knowledge	11
	PART - B (LONG ANSWER QUESTIONS)		
1	**Explain** different types of intellectual property in detail?	Understand	1
2	**Explain** the functions of international intellectual property organizations?	Understand	1
3	**Explain** the agencies and treaties of intellectual property?	Understand	8
4	**Describe** the importance of intellectual property rights?	Knowledge	4
5	**Describe** about IPR? Do you think this is useful rights for us? Explain	Knowledge	4
6	**Explain** about International Organizations, Agencies, and Treaties?	Understand	4
7	**Discuss** whether the following items would be protectable as trademarks, copyrights, patents, or trade secrets: a) „Freeze You" as the name of a new type of ice cream b) a company"s plans for its future business operations and possible mergers c) a new type of rose d) a new slogan to be used by Burger King e) a new novel by Toni Morrison	Understand	4
8	**Distinguish** between Trademark and Trade secrets?	Understand	4
9	**Explain** why agencies responsible for Intellectual Property Registration with anytwo examples?	Understand	1
10	**Describe** the importance of International organisation? When it was established?	Knowledge	1

11	**Explain** why the International Organization, Agencies and Treaties were established? Give any Five International agreements and treaties that affect Intellectual property?	Understand	3
12	**Explain** the reasons for increasing importance for Intellectual Property Rights?	Understand	3
13	**Explain** the International organizations, Agencies and treaties?	Understand	5
14	**Explain** Federal Registration of Trademarks?	Understand	2
15	**Describe** why Trade Secrets are necessary? how do they function?	Knowledge	5
16	**Explain** the functions of INTA, WIPO?	Knowledge	1
17	**Express** your views about the Intellectual Property Rights necessity for thecountries?	Understand	1
18	**Explain** about patent?	Understand	8
19	**Explain** about different types of Intellectual property??	Understand	4
20	**Write** about the following terms: a) Trademark and Service marks b) Copyrights c) Patent d) Trade Secrets	Apply	4
21	**Explain** the scope of searching in Trademark?	Understand	5

S.No	Questions	Blooms Taxonomy Level	Course Outcome
22	**Write** the procedure for "use of mark" owned by Third parties?	Understand	2
23	**Write** the New Development in Assignment of Domain Names under Trademark	Knowledge	5
24	**Explain** cybersquatters and the dilution doctrine under protecting a Domain name in Trademark?	Knowledge	1
25	**Explain** Cybersquatters and the Anticybersquatting consumer Protection Act?	Understand	1
	Part – C (Problem Solving and Critical Thinking)		
1	**Categories** whether the following items would be protectable as trademark, Copyrights, Patents or Trade Secrets: a) a vacuum cleaner (the name of a new type of ice cream) b) a company"s plans for its future business operations and possible mergers c) a new type of rose d) a new slogan to be used by Burger King e) a new novel by Toni Morrison	Apply	1
2	**Analyze** Mc Donald"s Corporation has filed a trademark application for MCMAGIC MIXERS for new condiment blends, will the mark is protectable if so explain?	Analyze	1
3	**Discriminate** types of copyrights in cinema autography in India?	Understand	8
4	**Estimate** the time period for the protection of son "Allentown" was composed Billy Joel in 1982?	Analyze	4
5	**Calculate** the loss occurred to the US for infringement in IP and counterfeiting of goods and piracy	Analyze	4
	UNIT – II		
	PART - A (SHORT ANSWER QUESTIONS)		
1	**Explain** the purpose of Trademark?	Understand	3
2	**Define** goodwill?	Knowledge	2
3	**Explain** the origin function of trademark?	Understand	2
4	**Explain** the trademark rights arise in law of United states?	Understand	3
5	**Explain** the Quality guarantee in function of trademark?	Understand	5
6	**Explain** the Advertising function of trademark?	Understand	4
7	**Write** about the procedure for recognizing trademark in France?	Apply	4
8	**Define** the uses of acquisition of Trademark rights?	Knowledge	3
9	**Give** examples for acquisition of Trademark rights taken place?	Understand	4
10	**Explain** how protectable matter did rises and on what basis it is adopted?	Understand	4
11	**Define** evaluating trademark?	Knowledg	4

		e	
12	**Evaluate** the trademark?	Analyze	3
13	**Explain** how the trademarks and service marks properly identified and used?	Understand	7
14	**Classify** the types of marks?	Understand	6
15	**Give** examples for trade mark selection?	Understand	7
16	**Write** about Indian Trade mark law?	Apply	7
17	**Write** the scope for searching the state trademark?	Apply	6
18	**Discuss** the conflicts of trademarks?	Understand	8
19	**Explain** the procedure for evaluating Trademark?	Understand	6
20	**Write** the classes in Service mark?	Understand	1
21	**Write** the types of Marks?	Knowledge	6
22	**Write** the procedure of Trademark search?	Understand	7

S.No	Questions	Blooms Taxonomy Level	Course Outcome
23	**Explain** duty to search for Trademark?	Understand	6
24	**Discuss** types of searching process?	Understand	7
25	**Write** the duty of an applicant in selecting a Trademark?	Knowledge	9
	PART - B (LONG ANSWER QUESTIONS)		
1	**Explain** acquisition of trademark rights?	Understand	4
2	**Write** the procedure for Selecting and evaluating of trademark?	Apply	4
3	**Discuss** the functions of trademark?	Understand	1
4	**Describe** Protectable matter?	Knowledge	1
5	**Explain** trademark registration processes?	Understand	3
6	**Discuss** the method of protecting the prior used trademarks in the system ofacquisition-through-registration?	Understand	3
7	**Explain** the reasons for protecting trademarks in the system of acquisition?	Understand	5
8	**Discuss** new developments in Trademark Law? how do you avoid cyberspacetrademark issues?	Understand	2
9	**Explain** how do you select and evaluate Trademark?	Understand	1
10	**Explain** about the process of Trademark?	Understand	1
11	**Explain** how the investigation is taken place in resolving conflicts?	Understand	8
12	**Explain** the methods used in preparing the application in Trademark registration?	Understand	4
13	**Explain** the Principal and Supplemental Registers?	Understand	4
14	**Write** the procedure of the trademark registration?	Apply	4
15	**Explain** the Post registration procedures?	Understand	4
16	**Discuss** about the advantages of Trademark use and compliance policies?	Knowledge	4
17	**Describe** the Procedure for transfer of ownership in Trademarks?	Understand	1
18	**Explain** about Inter partes and inter partes proceedings? What is the role of Interpartes?	Understand	1
19	**Explain** Infringement of Trademarks?	Understand	3
20	**Discuss** about the methods of preparing the Trademark application?	Understand	3
21	**Write** the Rights afforded by Copyright Law?	Knowledge	1
22	**Discuss** the Rights to display the work publically?	Understand	3
23	**Explain** the effects of works made for hire?	Understand	3
24	**Write** the different types of Application Forms in Copyright?	Knowledge	1
25	**Explain** the searching process in copyright office records?	Understand	3

Part – C (Problem Solving and Critical Thinking)			
1	**Devise** an application for registration of different types of marks in PTO and anIndian IPR organization?	Understand	3
2	**Distinguish** the register mark AVALON BAY PERFUME and AVALAR BAY PERFUME? Discuss whether the marks are confusingly similar and will they accepted by the PTO, explain?	Knowledge	2
3	**Illustrate** the basis for filling application and methods of use with appropriateacts	Analyze	2
4	**Describe** the type of specimen that would support use of the following marks:PLAYROOM (for child care center services) AQUARIUM (for restaurant services)	Understand	3
5	**Explain** if an application for INTEGRA COMPUTER SERVICES (for computer consulting services) is refused registration on the basis that the mark is merely descriptive, how the applicant should respond?	Understand	5

S.No	Questions	Blooms Taxonomy Level	Course Outcome
	UNIT – III		
	PART A (SHORT ANSWER QUESTIONS)		
1	**Define** the law of copyrights?	Knowledge	6
2	**Write** the Fundamental of Copyrights laws was formulated	Apply	5
3	**Discuss** the originality of material in copyrights?	Understand	9
4	**Explain** the rights of reproduction in copy rights?	Understand	8
5	**Write** the procedure of „rights to perform the work publicly" in copy rights?	Apply	5
6	**Explain** how the copy right ownership issues are solved?	Understand	9
7	**Explain** how the copy rights are registered?	Understand	9
8	**Discuss** the Foundation of patent law?	Understand	5
9	**Describe** the advantages of Law of patent?	Knowledge	9
10	**Illustrate** patent searching process?	Analyze	8
11	**Explain** how the ownership rights and transfers are taken place?	Understand	5
12	**Write** about the notice of copy right?	Apply	8
13	**Describe** about copy rights?	Knowledge	5
14	**Explain** how the patent searching process is taken place?	Understand	9
15	**Discuss** about copy rights?	Understand	9
16	**What** did you understand about Law of patents?	Understand	8
17	**Write** about the procedure for „the notice of the copy right" is prepared?	Apply	7
18	**Define** the rights of ownership issues?	Knowledge	9
19	**Write** surplusage in Copyright Notice?	Apply	9
20	**Describe** the procedure restoration of Copyright is done?	Knowledge	8
21	**List** out the copyright excluded from protection?	Knowledge	8
22	**Explain** "Works made for Hire"?	Apply	7
23	**Write** the types of Application?	Knowledge	7
24	**Write** the procedure of filing the application?	Understand	8
25	**Write** the importance of Copyright Notice?	Apply	7
	PART - B (LONG ANSWER QUESTIONS)		
1	**Explain** about copyright Law and when it was founded?	Apply	6
2	**Discuss** about the Rights under the 1976 copyright act?	Understand	5
3	**Explain** the subject matter of copyright?	Understand	9
4	**Explain** the fundamental of Copyright Law?	Understand	8
5	**Define** the originality of material and how it is identified?	Knowledg	5

		e	
6	**Explain** the rights afforded by copyright law?	Understand	9
7	**Discuss** the rights of reproduction?	Understand	9
8	**Discuss** about "the rights to perform the work publicly" and explain it?	Understand	5
9	**Explain** copyright ownership issues?	Understand	9
10	**Explain** when the terminations of transfers of copyrights take place?	Understand	8
11	**Explain** when the duration of copyright act come into force?	Understand	5
12	**Explain** the procedure for fill the application and registration of copyright?	Understand	8
13	**Explain** the copyright notice and when it is issued?	Understand	5
14	**Discuss** about copyright infringement? Explain?	Understand	9
15	**Differentiate** Contributory Infringement and Vicarious Infringement?	Understand	9
16	**Discuss** about new developments in copyright law? What are they?	Understand	8
17	**Explain** the international copy right law?	Understand	7

S.No	Questions	Blooms Taxonomy Level	Course Outcome
18	**Define** Patentability? Explain the utility of patents?	Knowledge	9
19	**Write** about the need of patent searching? Explain?	Apply	9
20	**Explain** the process of the Patent Application?	Understand	8
21	**Explain** the Digital Millennium Copyright Act?	Understand	8
22	**Discuss** New development in Copyright?	Understand	7
23	**Discuss** New development in Patent?	Knowledge	9
24	**Explain** Vessel Hull Protection in Copyright?	Understand	
25	**Write** the Gray Market Goods?	Knowledge	9
	Part – C (Problem Solving and Critical Thinking)		
1	**Classify** the following as likely copyrightable or not copyrightable: a) a live broadcast of a radio program; b) a speech written for the secretary of defence; c) the artwork for the cover of a CD; d) a new method of calculating the value of business;	Analyze	6
2	**Analyze** a highly stylized electric mixer be copyrightable? Discuss?	Understand	5
3	**Analyze** if two artists each paint an oil painting of Niagara Falls, which painting receives copyrights protection? Discuss?	Understand	9
4	**Describe** the principles governing while a purchased book is later sold to others?	Knowledge	8
5	**Explain** the violation of copyrights in dramatic performances on television channels and cinema autography?	Knowledge	5
	UNIT – IV		
	PART - A (SHORT ANSWER QUESTIONS)		
1	**Write** about Trade secrets?	Apply	9
2	**Explain** the determination of trade secrete status?	Understand	9
3	**Determine** the affect for misappropriations of trade secrets?	Apply	12
4	**Write** the procedure to be followed for protection for submission?	Apply	11
5	**Discuss** about trade secrets?	Understand	11
6	**Explain** liability for misappropriation of trade secrets?	Understand	12
7	**Discuss** about the protection for submission?	Understand	11
8	**Explain** defences to Trade Secret Misappropriation? Give to remedies for Misappropriation?	Understand	12
9	**Define** trade secret protection programs?	Knowledge	12
10	**Describe** trade secret protection program	Understand	12
11	**Explain** about the new developments in International Trade secrets law?	Understand	12
12	**Write** five physical protections in trade secret protection program?	Apply	12

13	**Write** four written agreements? Briefly explain them?	Apply	12
14	**Discuss** unfair competition?	Understand	12
15	**Discuss** about unfair competition act? When it came into existence?	Understand	12
16	**Describe** the unfair competition act is useful in the trademarks?	Understand	8
17	**Write** about two unfair competitions?	Apply	11
18	**Write** about misappropriation under unfair competition?	Apply	12
19	**What** is Right of Publicity?	Understand	12
20	**Discuss** about false advertising?	Understand	12
21	**Discuss** whether written agreement is compulsory or not in Trade secret?	Understand	12
22	**Write** the relationship between Employer and Employee in a Trade Secret?	Understand	8

S.No	Questions	Blooms Taxonomy Level	Course Outcome
23	**List** out the defences to trade secret misappropriation?	Apply	11
24	**Write** four examples for False advertising?	Apply	12
25	**Explain** five New International Development in Trade secrets?	Understand	12
	PART - B (LONG ANSWER QUESTIONS)		
1	**Define** Trade Secrets Law? Explain about Trade Secrets Law?	Knowledge	13
2	**Explain** the liability for misappropriation of trade secrets?	Understand	11
3	**Illustrate** Trade Secret Litigation?	Understand	10
4	**Discuss** about trade secret protection programs? Explain?	Understand	10
5	**Write** about new development in International trade secrets law? What are they?	Apply	9
6	**Explain** about unfair competition? Write its types?	Understand	9
7	**Discuss** right of publicity? Explain?	Understand	9
8	**Discuss** Misappropriation in Trade Secrets and how the Right of Publicity help inmisappropriation?	Understand	9
9	**Discuss** whether the New Developments in the Right of Publicity is necessary, ifso in what way?	Understand	9
10	**Explain** false advertising with examples?	Understand	8
11	**Discuss** about the regulations taken by the Federal Trade Commission?	Understand	8
12	**Define** product disparagement? Explain them	Knowledge	8
13	**Explain** how the infringement of trade dress is involved in trade mark?	Understand	8
14	**Describe** defences to secret misappropriation?	Knowledge	8
15	**Explain** about the remedies for misappropriation in Trade Secrets?	Understand	8
16	**Discuss** about trade secret litigation?	Understand	9
17	**List** out the new developments in International Trade Secrets?	Knowledge	9
18	**Explain** the liability for misappropriation of trade secrets taken place?	Understand	9
19	**Describe** the determination of trade secret status?	Knowledge	9
20	**Explain** the product disparagement in unfair competition?	Understand	9
21	**Explain** with suitable examples about patentable subject matter?	Understand	10
22	**Write** the methods of Patent searching process?	Apply	9
23	**Explain** about patent infringement Litigation?	Understand	9
24	**Write** five new developments in International Patent?	Understand	9
25	**Write** the remedies in patents infringement?	Understand	9
	Part – C (Problem Solving and Critical Thinking)		

1	**Explain** the action taken by PepsiCo? On a competitor selling another type ofcola beverage in Pepsi bottles?	Knowledge	11
2	**Discuss** what type of trademark dilution is involved for each of the following: a) Nestle pens; b) Lexus photocopiers c) Mattel‟s Head Shop (for a shop selling drug paraphernalia)	Knowledge	13
3	**Classify** the liability for misappropriation of trade secrets?	Analyze	10
4	**Explain** different types of remedies for misappropriation from a court?	Knowledge	10
5	**Discuss** the remedies for Mr Woods for using his photograph in the following: a) an advertisements for golf clubs b) a new story about young golfers; and c) an advertisement for pizza	Understand	9
	UNIT – V		

S.No	Questions	Blooms Taxonomy Level	Course Outcome
	PART - A (SHORT ANSWER QUESTIONS)		
1	**Discuss** New Developments in Patent Law?	Understand	13
2	**Write** about International patent protection?	Apply	11
3	**Explain** how the International patent protection act is used?	Understand	10
4	**Discuss** about International Patent protection?	Understand	10
5	**Explain** about the Paris convention?	Understand	9
6	**When** did Paris convention established and for what?	Understand	9
7	**Explain** why the Paris convention is introduced?	Understand	9
8	**Explain** copy write law?	Understand	9
9	**Define** the copy write law is useful?	Knowledge	9
10	**Describe** the reasons for introducing copyright law?	Knowledge	8
11	**Explain** about intellectual property audit?	Understand	8
12	**Write** the duties of IP audit?	Apply	8
13	**Discuss** about the International trade mark Law?	Understand	8
14	**Discuss** about the International patent law?	Understand	8
15	**Describe** the advantages of International Patent law?	Knowledge	8
16	**Explain** trade secrets Law?	Understand	9
17	**Write** the advantages about trade secrets law?	Apply	9
18	**Discuss** why the trade secrets law is developed internationally?	Understan	9

		d	
19	**Explain** the patent law treaty?	Understand	9
20	**Discuss** about patent cooperation treaty?	Understand	9
21	**Discuss** about Dilution?	Understand	12
22	**Write** about Trade dress?	Understand	12
23	**Explain** about Post audit activity?	Understand	8
24	**List** out the liabilities for misapplication of Trade Secrets?	Apply	11
25	**Write** the determination of trade secret statues?	Apply	12
PART - B (LONG ANSWER QUESTIONS)			
1	**Explain** about the new developments in Trademark law?	Understand	12
2	**Discuss** how do you protect a domain name? Explain the precautionary steps tobe taken for protecting domain name in trademark?	Understand	12
3	**Explain** how the cyber crime can control in trademark? how you hyperlink?	Understand	12
4	**Explain** cybersquatters and the Anticybersquatting consumer Protection Act?	Understand	12
5	**Discuss** new development in protecting copyright law? what are they? Explain?	Understand	12
6	**Explain** how a copyright protection is overcoming the cyber crime?	Understand	12
7	Describe about copyright protection act? how the copyright protection forautomated database is processed?	Knowledge	13
8	**Explain** copyright in the electronic age?	Understand	11
9	**Describe** the digital millennium copyright act?	Knowledge	13
10	**Explain** the new developments in copyright and recent developments in copyrightlaw?	Understand	13
11	**Define** Vessel Hull protection? How it is useful in copyrights act?	Knowledge	13
12	**Explain** semiconductor chip protection?	Understand	
13	**Discuss** new developments in international patent law? How can you analyzethem?	Understand	13
14	**Explain** the International patent protection?	Understand	13

S.No	Questions	Blooms Taxonomy Level	Course Outcome
15	**Discuss** about patent cooperation treaty?	Understand	13
16	**Discuss** about European patent organization and what are its duties?	Understand	13
17	**Explain** about patent law treaty with suitable examples?	Understand	13
18	**Discuss** new developments in trade secrets law?	Understand	13
19	**Discuss** about international developments in trade secrets law?	Understand	13
20	**Discuss** about intellectual property audits?	Understand	13
	Discuss what type of Trademark Dilution is involved for each of the followingand why it is in Trademark Dilution? a. Lexuz photocopiers b. Nestle pens c. Barbie‟s Toys d. Mattle‟s Head shop	Knowledge	13
22	**Write** the advantages and disadvantages of TRIPs**?**	Understand	12
23	**Explain** EPO**?**	Knowledge	13
24	**Write** the Digital Millennium Copyright Act?	Understand	12
25	**Write** recent Developments in Copyright law?	Knowledge	13
	Part – C (Problem Solving and Critical Thinking)		
1	**Explain** new developments in the copyright protection for following: a) Computer programs b) Video games c) Piracy of software	Analyze	12
2	**Describe** the new development in patent law relating for the: a) Business method b) Software patents c) Biotechnology patents	Understand	12
3	**Illustrate** the importance of IP audit in different business organisation?	Knowledge	12
4	**Explain** the practical aspects of IP audits and process of conducting audit?	Knowledge	12
5	**Distinguish** International trademark law and copy right law?	Understand	12

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

COMPUTER SCIENCE ANDENGINEERING

COURSE DESCRIPTION FORM

Course Title	**COMPUTER NETWORKS**			
Course Code	**2050511**			
Regulation	**R20**			
Course Structure	Lectures	Tutorials	Practical	Credits
	3	-	-	3
Course Faculty	**G Anitha, Asst.Prof**			

I. COURSE OVERVIEW:

The growing importance of Internetworking in recent years and their use in every field has made Computer Networks a central issue for modern systems. The main objective of the course is to know the functions of various layers of a network model. Topics to be covered include: data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication, network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols, various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.

PREREQUISITE(S):

Level	Credits	Periods/ Week	Prerequisites
UG	3	3	Data Structures, Data Communications, Computer Organization, LinuxOperating Systems

II. MARKS DISTRIBUTION:

Sessional Marks	University End Exam marks	Total marks
Midterm Test There shall be two midterm examinations. Each midterm examination consists of essay paper. The essay paper is for 25 marks of 90 minutes duration and shall contain PART-A and PART-B. PART-A of 10 marks, It consists 10 questions student has to answer all questions each carries 1 Mark, PART-B of 15 marks, It contains 3 questions with internal choice, each question carries 5 marks.	70	100

VALUATION SCHEME:

S. No	Component	Duration	Marks
1.	I Mid Examination	90 minutes	25
2.	I Assignment	-	5
3.	II Mid Examination	90 minutes	25
4.	II Assignment	-	5
5.	External Examination	3 hours	70

III. COURSE OBJECTIVES:

At the end of the course, the students will be able to:

I. Build an understanding of the fundamental concepts of computer networking.
II. Familiarize with the basic taxonomy and terminology of the computer networking area.
III. Introduced to advanced networking concepts, preparing for entry to advanced courses in computernetworking.
IV. Allow to gain expertise in some specific areas of networking such as the design and maintenance ofindividual networks.

IV. COURSE OUTCOMES:

1. Students should be understand and explore the basics of Computer Networks and Various Protocols. He/She willbe in a position to understand the World Wide Web concepts.
2. Students will be in a position to administrate a network and flow of information further he/she can understandeasily the concepts of network security, Mobile, and ad hoc networks.

HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed
PSO1	**Applications of Computing**: Ability to use knowledge in variousdomains to provide solution to new ideas and innovations.	H	Lectures, Assignments
PSO2	**Programming Skills**: Identify required data structures, design suitablealgorithms, develop and maintain software for real world problems.	H	Projects

V. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specializationto the solution of complex engineering problems.	H	Lectures
PO2	**Problem analysis**: Identify, formulate, review research literature, andanalyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	H	Lectures, Assignments,Exams
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	H	Problem Solving Seminars, Exercises
PO4	**Conduct investigations of complex problems**: Use research- basedknowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information toprovide valid conclusions.	H	Lectures, Assignments,Exams
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction andmodeling to complex engineering activities with an understanding of the limitations.	H	Lectures, Assignments, Workshops

PO6	**The engineer and society**: Apply reasoning informed by thecontextual knowledge to assess societal, health, safety, legal and cultural issues andthe consequent responsibilities relevant to the professional engineering practice.	S	--
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainabledevelopment.	N	--
PO8	**Ethics**: Apply ethical principles and commit to professional ethics andresponsibilities and norms of the engineering practice.	S	--
PO9	**Individual and team work**: Function effectively as an individual, andas a member or leader in diverse teams, and in multidisciplinary settings.	H	Assessments Discussions,
PO10	**Communication**: Communicate effectively on complex engineeringactivities with the engineering community and with society at large,such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	N	--
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles andapply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary	S	--
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	S	--

SYLLABUS:

UNIT-I

Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history standards and administration. Comparison of the OSI and TCP/IP reference model.

Physical Layer: Guided transmission media, wireless transmission media.

Data Link Layer-design issues, CRC Codes, Elementary Data link Layer protocols, sliding window protocol.

UNIT-II

Multiple Access Protocols- ALOHA, CSMA, Collision free protocols, Ethernet-Physical Layer, Ethernet MacSub layer, data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways.

UNIT-III

Network Layer: Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Count to Infinity Problem, Hierarchical Routing, Congestion control algorithms, admission control.

UNIT-IV

Internetworking: Tunneling, Internetwork Routing, Packet fragmentation, IPv4, IPv6 Protocol, IP addressesCIDR, IMCP, ARP, RARP, DHCP.

Transport Layer: Services provided to the upper layers elements of transport protocol-addressing connectionestablishment, connection release, Crash Recovery.

UNIT-V

The Internet Transport Protocols UDP-RPC, Real Time Transport Protocols,

The Internet Transport Protocols-Introduction to TCP, The TCP Service Model, The TCP SegmentHeader, The Connection Establishment, The TCP Connection Release, The Connection Management Modeling, The TCP Sliding Window, The TCP Congestion Control, The future of TCP.

Application Layer-Introduction, providing services, Application layer paradigms, Client server model, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS,SSH.

Text Books:

1. Behrouz A. Forouzan, “Data Communications and Networking”, 5e TMH, 2013.
2. Andrew S Tanenbaum, “Computer Networks”, 4e, Pearson Education.

Reference Books:

1. S. Keshav, “An Engineering Approach to Computer Networks”, 2e, Pearson Education.

2. W. A. Shay, "Understanding communications and Networks", 3e, Cengage Learning.
3. Chwan-Hwa(John)Wu, J.David Irwin, "Introduction to Computer Networks and Cyber Security", CRCPress.
4. L. L. Peterson and B. S. Davie, "Computer Networks", 4e, Elsevier.
5. James F. Kurose, K. W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", 3e,Pearson Education.

VI. COURSE PLAN:

LectureNo.	Topics to be covered	Course Learning Outcomes	Reference
1	Protocols and layering scenario	**Understand** and explore the basics of computer networks and various network protocols.	T1:2.1
2	OSI model	**Demonstrate** guidelines for the development of universally compatible networking protocols using OSI model.	T1:2.3
3	Internet history standards and administration and comparison ofthe OSI and TCP/IP reference model	**Recognize** knowledge on previous versions of internet and demonstratesthat TCP/IP protocol is not replacement for OSI model.	T1:2.3.1
4-8	Guided and wireless transmissionmedia	**Illustrate** guided and unguidedmedium.	T1:7.2,7.3
9	Design issues of CRC codes	**Illustrate** the purpose of error detection and correction techniques.	T1:10.3.1
10-19	Elementary data link layerprotocol: sliding window protocol ALOHA, CSMA and collisionfree protocols	**Design** and implement data link layer protocol with in a simulated networkingenvironment.	T1:11.2, 12.1.1,12.1.2,
20-21	Ethernet-physical layer andMAC sub layer	**Describe** how networked devices can format data for transmission to other network devices on the same network segment using Ethernet.	T1:13.3.2,13.4.1

22-24	Data link layer switching & useof bridges, learning bridges,spanning tree bridges, repeaters,hubs, switches, routers and gateways	**Understand** the working concepts ofthe switching devices.	T1:17.1.1,17.1.3
25 - 27	Network layer design issues, store and forward packetswitching, connection-less and connection-oriented networks	**Identify** global addressing systemand routing procedures	T1:18.1, 18.2.1
28-30	Routing algorithms	**Understand** various routing algorithms and analyze the shortest path between any two stations.	T1:20.2
31-34	Congestion control algorithmsand admission control	**Understand** the mechanisms to handle congestion scenarios on networks.	T1:18.3.4,18.3.4.1
35-36	Tunneling, internetworking and packet fragmentation	**Illustrate** the pros and cons oftunneling.	T1:22.12,19.1.2

LectureNo.	**Topics to be covered**	**Course Learning Outcomes**	**Reference**
37-40	IPv4, IPv6 Protocol andIP addresses CIDR	**Compare** popular internet protocolsIPV4 and IPV6.	T1:18.4,18.4.3
41-43	ICMP, ARP, RARP and DHCP	**Understand** various address relatedprotocols.	T1:19.2,18.4.4
44-46	Services provided to the upper layers elements of transport protocol and addressing connection establishment, connection release, crashrecovery	**Describe** how transport Layer protocol provides process-process delivery and evaluate the recovery of crashed data packets.	T1:23.1.1,23.1.3
47-49	UDP-RPC and Real TimeTransport Protocols(RTP)	**Describe** the practical use of UDPand RTP protocols.	T1:24.2,28.4
50-54	Introduction to TCP, TCP service model, segment header, connection establishment, release and management modeling	**Explain** three way handshakingprocedure of TCP.	T1:24.3.1, 24.3.3,24.3.4

55-58	The TCP sliding window, congestion control and future ofTCP	**Understand** the packet transmissionmechanism of TCP.	T1:24.3.6, 24.3.9
59-60	Introduction, providing services,application layer paradigms and client server model, standardclient-server application	**Apply** latest client – server technologies to configure and manage web servers.	T1:25.1,25.1.2
61-64	HTTP, FTP, electronic mailTELNET and SSH	**Explain** purpose of FTP for file transfer and access remote systemthrough remote login.	T1:26.1.2,26.2, 26.3, 26.4,26.5
65-67	DNS	**Define** name space, Domain Name Space and explain how to assign the domain for different organization.	T1:26.6

VII. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAMOUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Program outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO 1**	**PSO 2**	**PSO 3**
C312.1	3	1	0	0	0	0	0	0	0	0	0	0	2	0	0
C312.2	3	2	2	2	0	0	0	0	0	0	0	0	3	0	2
C312.3	3	1	1	1	0	0	0	0	0	0	0	0	3	0	2
C312.4	3	2	2	2	0	0	0	0	0	0	0	0	3	0	2
C312.5	3	1	1	1	0	0	0	0	0	0	0	0	3	0	2
Average	**3**	**1.4**	**1.5**	**1.5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2.8**	**0**	**2**

ASSIGNMENT

Course Name	**COMPUTER NETWORKS**
Course Code	2050511
Class	III B. Tech I Semester
Branch	Computer Science and Engineering
Year	2020– 21
Course Faculty	**G Anitha, Asst.Prof**

OBJECTIVES:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner‟s learning process.

ASSIGNMENT – I & II

S. No	Questions	Blooms Taxonomy Level	Course Outcome
	UNIT – I		
1.	**List** two advantages of layering principle in computer networks?	Knowledge	2
2.	**Explain** the role of ARPANET in computer networks?	Knowledge	2
3.	**Distinguish** between baseband transmission and broadband transmission?	Understand	
4.	**Suggest** two points to improve the performance of network?	Understand	1
5.	**Write** the responsibilities of the data link layer in the Internet model?	Understand	2
6.	**Distinguish** between baseband transmission and broadband transmission?	Understand	2
7.	**Define** topology and explain the topologies of the network?	Understand	2
8.	Consider a 1 km 10Mbps channel. What would be the utilization of this channel when 100 nodes are connected in an Ethernet configuration? If the channel is converted to a ring, running token ring, what would be the utilization of the channel? Assume fixed frame size of 1024 bits in both cases?	Understand	2
9.	**Explain** in detail the different transmission media and compare and contrast them of cost, speed, security, attenuation and other in terms of relevant characteristics?	Understand	1
10.	**Explain** why sliding window flow control is considered to be more efficientthan stop and wait flow control?	Understand	2
	UNIT- II		
1.	**Define** vulnerable period? How it affects the performance in MACprotocols?	Understand	1
2.	**Define** parameter „a"? How does it affect the performance of the CSMAprotocol?	Understand	1
3.	**Explain** how throughput is improved in slotted ALOHA over pureALOHA?	Understand	1
4.	**Distinguish** between FDMA and TDMA?	Understand	1
5.	**Explain** how a Token Ring LAN operates? Discuss that can be used to setup wireless LAN"s?	Understand	1
6.	**Name** the four basic network topologies and explain them giving all theRelevant features?	Understand	1
7.	**Explain** the frame format, operation and ring maintenance feature of IEEE 802.5 MAC protocol?	Understand	1
8.	**Assume** that a portion y of every transmitted packet is overhead (e.g., address,sync bits, etc.). 1. What will be the throughput delay characteristic of an FDMA channel? 2. What will be the throughput delay characteristic of a TDMA channel?	Apply	1

9.	**Compare** the first two moments of the distribution of the queuing time of FDMA with that of TDMA (Note: the queuing time does not include the actual transmission time)?	Understand	1
10.	**Derive** the steady-state distribution and the first two moments of the number of messages in a TDMA system where L (z) is the generating function of the number of packets in a message?	Understand	2
	UNIT – III		
1.	**List** out network support layers and user support layers?	Knowledge	2
2.	**Explain** internet protocol with the neat block diagram of IP header?	Understand	2
3.	**Describe** two groups of multicast routing protocol?	Understand	2
4.	**Describe** the routing information protocol and distance vector routingprotocol?	Understand	2
5.	**Explain** Link State Routing algorithm with an example?	Understand	2
6.	**Define** BGP protocol. Describe its routing functionality in detail?	Knowledge	1
7.	**Explain** Distance Vector algorithm. Mention the limitation of DistanceVector routing algorithm?	Understand	1
8.	**Compare** circuit switched, datagram and virtual circuit network	Understand	1
9.	**Write** short notes on a) X.25 b) ARP	Understand	1
10.	Show a routing table for a host that is connected to a LAN without beingconnected to internet? **Explain**?	Understand	1
	UNIT - IV		
1.	**Explain** the TCP Connection establishment and termination using Time-linediagram?	Understand	2
2.	**Illustrate** data units at different layers of the TCP / IP protocol suite?	Apply	2
3.	**Explain** how an application process running in one host is addressed byanother process through TCP?	Understand	2
4.	**Differentiate** between network layer delivery and the transport layerdelivery?	Understand	2
5.	**Describe** the three way handshake protocol to establish the transport levelconnection?	Understand	2
6.	**Discuss** about the TCP sliding window algorithm for flow control?	Understand	
7.	**Find** the class of the following IP addresses?a)237.14.2.1 b) 208 35.54.12 c) 129.14.6.8 d) 114.34.2.8	Apply	2
8.	An IPV4 datagram arrives with fragmentation offset of 0 and an M bit (more fragment bit) of 0.Is this a first fragment middle fragment or last fragment **Explain?**	Understand	2
9.	A router with IPV4 address 123.45.21.12 and Ethernet physical address23:45: BA: 00:67: CD has received a packet for a host destination with IP address 124.10.78.10.Show the entries in the ARP request packet sent bythe router. **Assume** no subnetting?	Apply	2

10.	**Write** the following MASKS in slash notation (/n)?a) 255.0.0.0 b) 255.255.224.0 c) 255.255.255.0 d) 255.255.240.0	Understand	2
	UNIT – V		
1.	**Describe** the role of the local name server and the aut2horitative name serverin DNS?	Understand	1
2.	**Discuss** how the Simple Mail Transfer Protocol (SMTP) is useful inelectronic mail?	Understand	1
3.	**Explain the** specific purposes of the DNS, HTTP, SMB, and SMTP/POPapplication layer protocols?	Understand	1
4.	**Define** Domain Name Service (DNS) and explain in detail about the domainhierarchy and name servers?	Knowledge	1
5.	**Compare** and contrast client/server with peer-to-peer data transfer overnetworks?	understand	1
6.	**Describe** in detail about the World Wide Web (WWW)?	Understand	1
7.	**Interpret** the following sequences of characters (In hexa decimals) receivedby a TELNET client or server? a) FFFB01 b) FFFE01 c) FFF4 d) FFF9	Apply	2
8.	A client uses UDP to send data to a server. The data are 15 bytes. **Calculate** the efficiency of this transmission at the UDP level (ratio of useful bytes tototal bytes)?	Understand	2
9.	**Determine** the sequence of bits sent from a client TELNET for the binary transmission of 11110011 00111100 11111111	Understand	2
10.	**Determine** which of the following an FQDN is and which is a PQDN? a) mil b) edu c) xxx.yyy.net d) zzz.yyy.xxx.edu	Understand	2

TUTORIAL QUESTION BANK

Course Name	**COMPUTER NETWORKS**
Course Code	**2050511**
Class	III B. Tech I Semester
Branch	Computer Science and Engineering
Year	2020 – 21
Course Faculty	**G Anitha, Asst.Prof**

OBJECTIVES:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome-based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this questionbank, which will enhance learner‟s learning process.

UNIT – I			
PART - A (SHORT ANSWER QUESTIONS)			
S. No.	**Question**	**Blooms Taxonomy Level**	**Course Outcome**
1.	**Define** Network?	Knowledge	1
2.	**Explain** different types of networks?	Understand	2
3.	**Describe** Why are protocols needed?	Understand	2
4.	**Describe** Access point?	Understand	1
5.	**State** the goals of networks?	Knowledge	2
6.	**Describe** the importance of networking?	Understand	1
7.	**List** two advantages of layering principle in computer networks?	Knowledge	2
8.	**Classify** different types of Layers?	Understand	2
9.	**Define** the responsibilities of data link layer?	Knowledge	1
10.	**Enumerate** the types of errors?	Knowledge	1
11.	**Explain** the role of ARPANET in computer networks?	Understand	2
12.	**Discuss** two points to improve the performance of network?	Understand	1
13.	**Define** redundancy?	Knowledge	2
14.	**List** different types of Transmission Media?	Knowled	2

		ge	
15.	**Describe** Why are standards needed?	Understand	1
16.	**Explain** briefly about MAN?	Understand	1
17.	**Explain** about Sliding Window Protocol?	Understand	2
18.	**Explain** briefly about WAN?	Understand	2
19.	**Define** peer-to-peer process?	Knowledge	1
20.	**Describe** an internet?	Understand	2
21.	**Define** Intranet?	Knowledge	3
22.	**Define** Extranet?	Knowledge	1
23.	**Explain** briefly about LAN?	Understand	1
24.	**Describe** the advantages of a multipoint connection over a Point-to-point connection?	Understand	2
25.	**List** out the available detection methods?	Knowledge	2
26.	**Discuss** the responsibilities of the data link layer in the Internetmodel?	Understand	1
27.	**Differentiate** four basic topologies?	Understand	1
28.	**List** the advantages of CN?	Knowledge	1
29.	**List** the networks Applications?	Knowledge	1
30.	**Define** checksum?	Knowledge	2

PART – B (LONG ANSWER QUESTIONS)

1.	**Explain** how are OSI and ISO related to each other?	Understand	1
2.	**Illustrate** some of the factors that determine	Apply	2
3.	**List** the responsibilities of the data link layer in the Internet	Knowledge	2
4.	**Calculate** the hamming distance for each of the followingcode words? a) d(10000, 01000) b) d(10101, 10010) c) d(1111, 1111) d) d(0000, 00,00)	Understand	1
5.	**List** three types of transmission impairment?	Knowledge	1
6.	**Distinguish** between baseband transmission and	Understand	2
7.	**Explain** the categories of networks?	Understand	2
8.	**Explain** ISO/OSI Reference model with neat diagram?	Understand	1
9.	**Define topology** and explain the topologies of the network?	Knowledge	2
10.	**Explain** error detection and error correction techniques?	Understand	1
11.	**Explain** the flow control mechanism?	Understand	2
12.	**Explain** about HDLC?	Understand	1
13.	**Explain** the timers and time registers in FDDI?	Understand	1
14.	**Explain** error control mechanism?	Understand	2
15.	**Explain** about SONET and Bridges?	Understand	1
16.	**Describe** the advantages of a multipoint connection	Understand	1

17.	**Define** VRC, LRC, and CRC?	Understand	1
18.	**Discuss** how do the layers of the Internet model	Understand	1
19.	**Explain** about Guided media?	Understand	1
20.	**Describe** the Unguided Media?	Understand	1
PART – C (CRITICAL THINKING QUESTIONS)			
1.	**Calculate** the following consider an 1 km 10Mbps channel. What would be the utilization of this channel when 100 nodes are connected in an Ethernet configuration? If the channel is converted to a ring, running token ring, what would be the utilization of the channel? **Assume** fixed frame size of 1024 bits in both cases.	Understand	1
2.	**Describe** in detail about the concept of data transmission and its terminology with necessary example?	Understand	2
3.	For P = 110011 and M = 1100011, **find CRC**?	Understand	2
4.	**Discuss** For each of the following four networks,the consequences if a connection fails? a) Six devices arranged in a bus topology b) Four devices arranged in a ring topology c) five devices arranged in a mesh topology d) Seven devices arranged in a star topology	Understand	1
5.	**Explain** the following for Suppose a computer sends a frame to another computer on a bus topology LAN. The physical destination address of the frame is corrupted during the transmission. What happens to the frame? how can the sender be informed about the situation?	Understand	1
6.	**Design** the autonomous system with the following specifications : a. There are 8 networks (N1 to N8) b. There are 8 routers (R1 to R8) c. N1,N2,N3,N4,N5 and N6 are Ethernet LANs d. N7 and N8 are point to point WANs	Apply	1
7.	**Design** an organization with one primary and four secondary stations uses polling. The size of a data frame is 1000 bytes. The size of the poll, ACK, and NACK frames are 20 bytes each. Each station has 5 frames to send. How many total bytes are exchanged if there is no limitation on the number of frames a station can send in response to a poll?	Apply	1
UNIT – II			
PART - A (SHORT ANSWER QUESTIONS)			

S. No.	Question	Blooms Taxonomy Level	Course Outcome
1.	**Define** ALOHA?	Knowledge	1
2.	**List** out advantage of token passing protocol over CSMA/CDProtocol?	Knowledge	1
3.	**Define MAC**?	Knowledge	1
4.	**List** the drawbacks of token ring topology?	Knowledge	1
5.	**Define Ethernet**?	Knowledge	1
6.	**Illustrate** in what way the MAC protocol of FDDI differsfrom that of token ring?	Apply	1
7.	**Explain** how FDDI offers higher reliability than token ringProtocol?	Understand	2
8.	**Explain** the two techniques for implementing Ethernetswitches?	Understand	2
9.	**Define** Bridge?	Knowledge	2
10.	**Define** Hub?	Knowledge	2
11.	**Define** Router?	Knowledge	2
12.	**Explain** in what situations contention based MAC protocolsare suitable?	Understand	2
13.	**Illustrate** what is vulnerable period? how it affects theperformance in MAC protocols?	Apply	2
14.	**List** three categories of multiple access protocols?	Knowledge	1
15.	**Define** CSMA and CDMA?	Knowledge	1
16.	**Define** parameter „a"? how does it affect the performance ofthe CSMA protocol?	Knowledge	1
17.	**Explain** how performance is improved in CSMA/CDprotocol compared to CSMA protocol?	Understand	1
18.	**Explain** Vulnerable Time?	Understand	2
19.	**Distinguish** between FDMA and TDMA?	Understand	2
20.	**Define** Bandwidth?	Knowledge	1
	PART – B (LONG ANSWER QUESTIONS)		
1.	**State** the functions of MAC?	Knowledge	1

2.	**Explain** how performance is improved in CSMA/CD protocolcompared to CSMA protocol?	Understand	1
3.	**Explain** in brief? how CSMA/CA differs from CSMA/CD.	Understand	1
4.	**Explain** in details about the access method and frame formatused in Ethernet and token ring?	Understand	1
5.	**Explain** the working of carrier sense multiple access protocol?	Understand	1
6.	**Discuss** the MAC layer functions of IEEE 802.11?	Understand	1
7.	**Explain** in details the types of bridges?	Understand	1
8.	**Discuss** that can be used to set up wireless LAN‟s? How aToken Ring LAN does operate?	Understand	1
9.	**List** and briefly discuss the two different basictransmission technologies?	knowledge	1
10.	**List** the four basic network topologies and explain themgiving all the Relevant features?	knowledge	1
11.	**Explain** the frame format, operation and ring maintenancefeature of IEEE 802.5 MAC protocol?	Understand	2
12.	**Define** key requirements and functioning of wireless LANs?	Knowledge	2
13.	**Explain** why collision is an issue in a random access protocolcontrolled access or channelizing protocols ?	Understand	2
14.	**Compare** and contrast a controlled access protocol with achannelizing protocol?	Understand	2
15.	**Explain** do we need a multiple access protocol when we usethe local loop of the telephone company to access the internet?	Understand	1
16.	**List** out advantage of token passing protocol over CSMA/CD protocol?	Understand	1
17.	**Explain** how performance is improved in CSMA/CD protocolcompared to CSMA protocol?	Understand	2
18.	**Explain** how throughput is improved in slotted ALOHA overpure ALOHA protocol?	Understand	2
19.	**Define** key requirements and functioning of wireless LANs?	Knowledge	2
20.	**Explain** why collision is an issue in a random access protocol bucontrolled access or channelizing protocols ?	Understand	1
	PART -C (CRITICAL THINKING QUESTIONS)		
1.	**Derive** the Laplace transform of the message delay in FDMA in which every message contains a random number of packets. Compare the expected message delay with that of TDMA?	Understand	1
2.	**Assume** a network with one primary and four secondary stations uses polling. The size of a data frame is 1000 bytes. Thesize of the poll, ACK, and NAK frames are 32 bytes each.Each station has 5 frames to send. **How** many total bytes are exchanged if there is no limitation on the number of frames a	Understand	1

	station can send in response to a poll?		
3.	**Derive** the steady-state distribution and the first two momentsof the number of messages in a TDMA system where L (z) is the generating function of the number of packets in amessage?	Understand	1
4.	**Find** the throughput if each station is sending 10 frames/sec? One hundred stations on a pure ALOHA network share a 1- Mbps channel. if frames are 1000 bits long,	Understand	1

5.	**Assume** that a portion y of every transmitted packet is overhead (e.g., address, sync bits, etc.). 1. What will be the throughput delay characteristic of an FDMA channel? 2. What will be the throughput delay characteristic of a TDMA channel?	Understand	2
6.	**Find** the class of the following IP addresses?a) 237.14.2.1 b) 208..35.54.12 c) 129.14.6.8 d) 114.34.2.8	Understand	2
7.	**Assume** A router with IPV4 address 123.45.21.12 and Ethernetphysical address 23:45: BA: 00:67: CD has received a packet for a host destination with IP address 124.10.78.10.Show the entries in the ARP request packet sent by the router. Assume no sub netting?	Understand	2

UNIT – III			
PART - A (SHORT ANSWER QUESTIONS)			
S. No.	**Question**	**Blooms Taxonomy Level**	**Course Outcome**
1.	**Explain** Design Issues Of Network layer?	Understand	1
2.	**List** network support layers and the user support layers?	Knowledge	1
3.	**Define** the functions of LLC?	Knowledge	1
4.	**Illustrate** shortest path?	Apply	1
5.	**Define** Flooding?	Knowledge	1
6.	**Explain** Optimality principle?	Understand	1
7.	**Define** the functions of MAC?	Knowled	1

		ge	
8.	**Define** protocol data unit?	Knowled ge	1
9.	**Explain** Congestion Control?	Understa nd	2
10.	**Define** virtual circuit?	Knowled ge	2
11.	**List** out responsibilities of network layer?	Knowled ge	2
12.	**Define** datagram"s?	Knowled ge	2
13.	**Explain** how broadcast and multicast address is represente addressing scheme?	Understa nd	2
14.	**List** some of the uni-cast routing protocols?	Knowled ge	2
15.	**Differentiate** between Datagram and datagram networks?	Understa nd	1
16.	**Define** routers?	Knowled ge	1
17.	**Differentiate** between virtual circuit and virtual circuit networks?	Understa nd	1
18.	**List** out functions of IP?	Knowled ge	1
19.	**Explain** what is meant by routing algorithm?	Understa nd	2
20.	**Define** session routing?	Understa nd	2
21.	**Define** Flooding?	Knowled ge	2
22.	**Define** Link state Routing?	Knowled ge	1
23.	**State** Leaky bucket?	Knowled ge	1
24.	**Explain** Choke packet?	Understa nd	1
25.	**Define** packet switching?	Knowled ge	1
26.	**State** circuit switching?	Knowled ge	1
	PART – B (LONG ANSWER QUESTIONS)		
1.	**Define** switching? Explain Virtual circuit switching techniques?	Knowled ge	1
2.	**Explain** Packet switching technique in detail?	Understand	1
3.	**Explain** Internet Protocol with the neat block diagram of IP header format?	Understand	1
4.	**Discuss** about Address Resolution Protocol?	Understand	1
5.	**Explain** about Internet Control Message Protocol?	Understand	1
6.	**Define** BGP Protocol. Describe its routing functionality	Knowledge	2
7.	**Write** short notes on a) X.25 b) ARP?	Knowledge	2
8.	**Explain** the various congestion control mechanism in detail?	Understand	2
9.	**Explain** the Link State routing algorithm with an example?	Understand	2
10.	**Describe** the Routing Information protocol and Distance vector routing protocol?	Understand	2
11.	**Explain** the Datagram delivery and Forwarding in Internet Protocol?	Understand	2

12.	**Explain** the two approaches of packet switching techniques?	Understand	1
13.	**Define** Routers and explain the type of routers?	Knowledge	1
14.	**Explain** IP addressing method?	Understand	1
15.	**Describe** two groups of multicast routing protocols?	Understand	1
16.	**Illustrate** the routing strategies?	Understand	1
17.	**Explain** how check sum is calculated in TCP?	Knowledge	1
18.	**Explain** CODE BITS in TCP header?	Understand	1
19.	**Explain** how connection Establishment is acquiring?	Understand	2
20.	**Explain** how to release a connection from the network?	Understand	2

PART -C (CRITICAL THINKING QUESTIONS)

1.	**Find** out the contents of the table if the router received the following RIP message from router C? Net 1 2 Net 2 2 Net 3 4 Net 4 3 A router has the following RIP routing table: Net 1 5 B Net 2 1 C Net 3 2 F Net 4 4 G	Understand	1
2.	**Design** a router using DVMRP receives a packet with source address 10.14.17.2 From interface 2. If the router forwards the packet, what are the contents of the entry related to this address in the uni-cast routing table?	Understand	1
3.	**Explain** a frame goes from A to B. There is congestion in both directions. Is the FECN bit set? Is the BECN bit set?	Understand	1
4.	**Explain** a routing table for a host that is connected to a LAN without being connected to a internet?	Understand	1
5.	**Design** the autonomous system with the following specifications : There are 8 networks (N1 to N8) There are 8 routers (R1 to R8) a. N1,N2,N3,N4,N5 and N6 are Ethernet LANs b. N7 and N8 are point to point WANs c. R1 connects N1 and N2 d. R2 connects N1 and N7 e. R3 connects N2 and N8	Understand	1
6.	**Explain** in what situations contention based MAC protocols are suitable?	Apply	1
7.	**Explain** in what way the MAC protocol of FDDI differs from that of token ring?	Apply	1

UNIT – IV			
PART - A (SHORT ANSWER QUESTIONS)			
S. No.	**Question**	**Blooms Taxonomy Level**	**Course Outcome**
1.	**List** out functions of transport layer?	Knowledge	1
2.	**Define** Multi-protocol router?	Knowledge	1
3.	**List** out duties of the transport layer?	Knowledge	1
4.	**Define** BGP?	Knowledge	1
5.	**Differentiate** between network layer delivery and thetransport layer delivery?	Understand	1
6.	**Define** IP Address?	Knowledge	1
7.	**Define** quality of service?	Knowledge	1
8.	**Explain** Subnet Mask?	Understand	1
9.	**Define** Payload?	Knowledge	1
10.	**Explain** how an application process running in one host is addressed by another process through TCP?	Understand	2
11.	**Describe** Datagram Format of UDP?	Understand	1
12.	**Define** IMCP?	Knowledge	1
13.	**State** two protocols available at transport layer?	Knowledge	1
14.	**List** out various congestion avoidance techniques?	Knowledge	1
15.	**Distinguish** between Contention and Congestion?	Understand	1
16.	**Define** Tunneling?	Knowledge	1
17.	**State** the four major aspects of reliable delivery at thetransport layer?	Knowledge	1
18.	**State** the use of SYN and FIN bits in TCP?	Knowledge	1
19.	**Define** RARP?	Knowledge	1
20.	**Explain** DHCP?	Understand	2
21.	**Explain** about Transport Layer Services?	Understand	2
PART -B (LONG ANSWER QUESTIONS)			
1.	**Explain** the real transport protocol of UDP and how will youcalculate checksum in UDP?	Understand	1
2.	**Explain** the TCP segment format?	Knowledge	1
3.	**Write** short notes on Wrap around time (8)?	Knowledge	1
4.	**Describe** the Adaptive retransmission policy in	Understand	1
5.	**Explain** the TCP Connection establishment and terminationusing Timeline diagram?	Understand	1
6.	**Describe** the three way handshake protocol to establish thetransport level connection?	Understand	1
7.	**Explain** TCP state Transition diagram?	Understand	1
8.	**Explain** the connection establishment?	Understand	1
9.	**Discuss** about the TCP sliding window algorithm for flowcontrol?	Understand	1
10.	**Explain** congestion control algorithms in detail?	Understand	1
11.	**Explain** leaky bucket and token bucket algorithm?	Understand	1
12.	**Explain** UDP &TCP?	Understand	1
13.	**Explain** congestion avoidance techniques in detail?	Understand	1
14.	**List** major types of networks and explain?	Knowledge	1
15.	**Illustrate** data units at different layers of the TCP / IP protocol	Apply	2
16	**Discuss** Types of Payload?	Understand	2
17	**Define** Multiplexing?	Understand	2
18	**Explain** how connection Establishment is acquiring?	Understand	2
19	**Explain** how to release a connection from the	Understand	2

	network?		
20.	**Explain** congestion avoidance techniques in detail?	Understand	1

PART -C (CRITICAL THINKING QUESTIONS)1			
1.	**Write** the following MASKS in slash notation (/n)?a) 255.0.0.0 b) 255.255.224.0 c) 255.255.255.0 d) 255.255.240.0	Understand	1
2.	**Find** the class of the following IP addresses?a) 237.14.2.1 b) 208..35.54.12 c) 129.14.6.8 d) 114.34.2.8	Understand	1
3.	**Design** a router with IPV4 address 123.45.21.12 and Ethernet physical address 23:45: BA: 00:67: CD has received a packet for a host destination with IP address 124.10.78.10.Show the entries in the ARP request packet sent by the router. Assume no sub netting?	Understand	1
4.	**Explain** an IPV4 datagram arrives with fragmentation offsetof0 and an M bit (more fragment bit) of 0.Is this a first fragment middle Fragment or last fragment**?**	Understand	1
5.	**Describe** an IPV4 fragment has arrived with an offset value of100.How many bytes of the data were originally sent by the source before the data in this fragment**?**	Understand	1
6.	**Explain** the basic difference between IEEE 802.3 and switched Ethernet, as far as implementation is concerned.	Apply	1
7.	**Explain** the two techniques for implementing Ethernet switches.	Apply	1

UNIT - V

PART - A (SHORT ANSWER QUESTIONS)

S. No.	Question	Blooms Taxonomy Level	Course Outcome
1.	**Explain** Internet Transport Protocols?	Understand	1
2.	**Define** UDP?	Knowledge	1
3.	**State** advantages of stateless server of HTTP?	Knowledge	1
4.	**Define** message Formatting?	Knowledge	1
5.	**Define** TCP?	Knowledge	1
6.	**Differentiate** between FTP & HTTP?	Understand	1
7.	**Explain** TCP segment Header?	Understand	1
8.	**Explain** Sliding Window Protocol?	Understand	1
9.	**List** two applications of Application Layer?	Knowledge	1
10.	**Explain** DNS Name Space?	Understand	1
11.	**List** the advantages of Email?	Knowledge	2

12.	**Define** SMTP?	Knowledge	2
13.	**Explain** the concept of Telnet?	Understand	2
14.	**Define** FTP?	Knowledge	2
15.	**Explain** MIME?	Understand	1
16.	**Illustrate** the use of MIME Extension?	Apply	1
17.	**Explain** WWW?	Understand	2
18.	**Define** Lossy Compression and Lossless Compression?	Knowledge	1
19.	**List** two applications of Application Layer?	Remember	2
20.	**Define** SNMP?	Understand	1
PART -B (LONG ANSWER QUESTIONS)			
1.	**List** different Data types used for Presentation formatting?	knowledge	1
2.	**Define** two methods of HTTP?	knowledge	1
3.	**Define** Big-endian format and little-endian format?	knowledge	1
4.	**Describe** the role of the local name server and the authoritativename server in DNS?	Understand	1
5.	**Define** Domain Name Service (DNS) and explain in detailabout the domain hierarchy and name servers?	knowledge	1
6.	**Explain** in detail about the working principles of SimpleNetwork Management Protocol (SNMP) ?	Understand	1
7.	**Discuss** how the Simple Mail Transfer Protocol (SMTP)	Understand	1
8.	**Describe** in detail about the World Wide Web (WWW)?	Understand	1
9.	**Explain** the working principle of FTP in detail with neat diagram?	Understand	1
10.	**Explain** the WWW in detail?	Understand	1
11.	**Differentiate** between ARP and RARP?	Understand	1
12.	**Explain** the specific purposes of the DNS, HTTP, SMB, andSMTP/POP application layer protocols?	Understand	1
13.	**Compare** and contrast client/server with peer-to-peer datatransfer over networks?	Understand	1
14.	**Explain** three domains of the Domain Name Space?	Understand	1
15.	**Differentiate** between primary server and secondary server?	Understand	1
16.	**Differentiate** between FTP & HTTP?	Understand	1
17.	**Differentiate** between FTP & HTTP?	Understand	1
18.	**Define** Lossy Compression and Lossless Compression?	Understand	1
19.	**Explain** the specific purposes of the SMTP/POP application layer protocols?	Understand	1
20.	**Define** Domain Name Service (DNS) and explain in detailabout the domain hierarchy and name servers?	Understand	1
PART -C (CRITICAL THINKING QUESTIONS)			
1.	**Calculate** the efficiency of this transmission at the UDP level (ratio of useful bytes to total bytes)?A client uses UDP to send data to a server. The data are 15 bytes.	Understand	2
2.	**Design** a diagram to show the situation of the window before andafter?A TCP connection is using a window size of 12000 bytes and the previous acknowledgement number was 22001.It receives assignment with acknowledgment number 24001 and	Understand	2

	windowsizeadvertisement of 12000.		
3.	**Determine** which of the following an FQDN is and which is aPQDN? a) mil b) edu c) xxx.yyy.net d) zzz.yyy.xxx.edu	Understand	2
4.	**Interpret** the following sequences of characters (In hexadecimals) received by a TELNET client or server? a) FFFB01 b) FFFE01 c) FFF4 d) FFF9	Understand	2
5.	**Show** the sequence of bits sent from a client TELNET for thebinary transmission of 11110011 00111100 11111111	Understand	2
6.	**State** the main rules that should be used when installing a cable. Show that maximum cabling area for LAN for horizontal cabling runs is approximately 200m.What do you understand by	Understand	2
7.	**Calculate** the maximum number of class A, B and C network ids.What is the various classes of IP addressing?	Understand	2

COMPUTER SCIENCE AND ENGINEERING

COURSE DESCRIPTION FORM

Course Title	**SOFTWARE ENGINEERING**			
Course Code	2050513			
Regulation	**R20**			
Course Structure	Lectures	Tutorials	Practicals	Credits
	3	-	-	3
Course Faculty	M Pallavi, Asst.Prof			

COURSE OVERVIEW:

Software Engineering comprises the core principles consistent in software construction and maintenance: fundamental software processes and life-cycles, mathematical foundations of software engineering, requirements analysis, software engineering methodologies and standard notations, principles of software architecture and re-use, software quality frameworks and validation, software development, and maintenance environments and tools. An introduction to object-oriented software development process and design.

PREREQUISITE(S):

Level	Credits	Periods/ Week	Prerequisites
UG	3	5	OOAD

MARKS DISTRIBUTION:

Sessional Marks	University End Exam marks	Total marks
Midterm Test There shall be two midterm examinations. Each midterm examination consists of essay paper. The essay paper is for 25 marks of 90 minutes duration and shall contain PART-A and PART-B. PART-A of 10 marks, It consists 10 questions student has to answer all questions each carries 1 Mark, PART-B of 15 marks, It contains 3 questions with internal choice, each question carries 5 marks.	70	100

EVALUATION SCHEME:

S. No	Component	Duration	Marks
1.	I Mid Examination	90 minutes	25
2.	I Assignment	-	5
3.	II Mid Examination	90 minutes	25
4.	II Assignment	-	5
5.	External Examination	3 hours	70

COURSE OBJECTIVES:

I Be familiar with basic Software engineering methods and practices, and its applications.
II Master the implementation of software engineering layered technology and Process frame work.III Be familiar with software measurement and software risks.
IV Be familiar with software requirements and the SRS documents.
V Be familiar with role of project management including planning, scheduling, risk management.VI Master the implementation of different software architectural styles.

COURSE OUTCOMES:

At the end of the course the student will develop ability to

CO	Course outcome	Blooms taxonomy level
C314.1	Translate end-user requirements into system and software requirements	Understand
C314.2	Understand structure the requirements in a Software Requirements Document (SRD).	Analyse
C314.3	Identify and apply appropriate software architectures and can assessment of the problem	Analyse
C314.4	Develop a simple testing report	Apply
C314.5	Design the high level design of a system and be able to critically compare alternative choices.	Apply

HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed
PSO1	**Applications of Computing**: Ability to use knowledge in variousdomains to provide solution to new ideas and innovations.	H	Lectures, Assignments
PSO2	**Programming Skills**: Identify required data structures, design suitablealgorithms, develop and maintain software for real world problems.	H	Projects

1. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiencyassessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization tothe solution of complex engineering problems.	H	Assignments ,Tutorials
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	H	Assignments
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	S	Mini Projects
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	S	Projects
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	S	Mini Projects
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	N	--

PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainabledevelopment.	N	--
PO8	**Ethics**: Apply ethical principles and commit to professional ethics andresponsibilities and norms of the engineering practice.	N	--
PO9	**Individual and team work**: Function effectively as an individual, andas a member or leader in diverse teams, and in multidisciplinary settings.	S	Mini Projects
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, suchas, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clearinstructions.	N	--
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and applythese to one‟s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	H	Mini Projects
PO12	**Life-long learning**: Recognize the need for, and have the preparationand ability to engage in independent and life-long learning in the broadest context of technological change.	S	Projects

N - None S - Supportive H - Highly Related

VIII. SYLLABUS:

UNIT-I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, legacy software, Software Myths.

A Generic View of Process: Software engineering-A layered technology, a process framework, The CapabilityMaturity Model Integration (CMMI), Process Patterns, Process Assessment, personal and team process models. **Process Models**: The Waterfall model, Incremental process models, Evolutionary Process Models, SpecializedProcess Models, The Unified Process.

UNIT-II

Software Requirements: Functional and non-Functional Requirements, User Requirements, SystemRequirements, Interface Specification, the software requirement document.

Requirement engineering process: Feasibility studies, Requirements elicitation and analysis, requirementsvalidation, Requirements management.

System models: Context Models, behavioral models, Data models, object models, structured method.

UNIT-III

Design Engineering: Design process and design quality, Design concepts, the design model, pattern based software design.

Creating an Architectural Design: Software architecture, Data design, Architectural Styles and patterns, Architectural design, assessing alternative architectural designs, mapping data flow into software architecture.**Modeling Component-level design:** designing class –based components, conducting component-level design, object constraint language, designing conventional components.

Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

UNIT-IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, system testing, the art of debugging.

Product metrics: Software Quality, Frame work for product metrics, Metrics for Analysis Model, Metrics forDesign Model, metrics for source code, metrics for testing, metrics for maintenance.

Metrics for process and products: Software Measurement, Metrics for software quality.

UNIT-V

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection,Risk refinement, RMMM, RMMM plan.

Quality Management: Quality concepts, software quality assurance, Software Reviews, Formal technical Reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

Text books:

1. Software engineering a practitioner‟s approach, Roger S Pressman, sixth edition Mc Graw HillInternational Edition.
2. Software Engineering, Ian Sommerville, seventh edition, Pearson education.

References:

1. Software Engineering, a Precise Approach, PankajJalote, Wiley India, 2010.
2. Software Engineering: A primer, Waman S Jawadekar, Tata McGraw-Hill, 2008.
3. Fundamentals of Software Engineering, Rajib Mall, PHI, 2005.

IX. COURSE PLAN:

At the end of the course, the students are able to achieve the following course learning outcomes.

Lecture No.	Topics to be covered	Course Learning Outcomes	Reference
1-4	The evolving role of software, ChangingNature of Software. Legacy software, Software Myths.	**Explain** the evolution of software	T1:1.1 T1:1.4
5	Software engineering-A layered technology, aprocess framework.	**Explain** process frame work	T1:2.1
6	The Capability Maturity Model Integration(CMMI).	**Illustrate** CMMI	T1:2.3
7-9	Process Patterns, Process Assessment, personal and team process models.	**Explain** process patterns	T1:2.4
10-15	The Waterfall model, Incremental process models, Evolutionary Process Models, Specialized Process Models, The Unified Process.	**Demonstrate** waterfall model, incremental evolutionary, specializedmodels	T1:3.2
16-18	Functional and non-Functional Requirements	**Distinguish** between Functional andnon-Functional Requirements	T2:6.1
19-22	User Requirements, System Requirements. Interface Specification, the software requirement document	**Discuss** user and system requirements, **Explain** softwarerequirement document	T2:6.2
23-25	Requirements elicitation and analysis, requirements validation, Requirements management	**Demonstrate** requirement management	T2:7.2
26-32	Context Models, behavioral models, Datamodels, object models, structured method	**Demonstrate** Design Engineering	T2:8.1
33-35	Design process and design quality, Designconcepts	**Explain** design concepts	T1:9.2
36-37	The design model, pattern based softwaredesign	**Explain** software design	T1:9.4
38-41	Software architecture, Data design, Architectural Styles and patterns, Architecturaldesign	**Demonstrate** Architectural Stylesand patterns	T1:10.1
42-44	Assessing alternative architectural designs, mapping data flow into software architecture.	**Illustrate** data flow in softwarearchitecture	T1:10.5
45-46	Designing class –based components, conducting component-level design, object constraint language, designing conventional components	**Explain** component level design	T1:9.3

47	Golden rules, User interface analysis anddesign, interface analysis	**Summarize** golden rules	T1:12.1
48	Interface design steps, Design evaluation.	**Explain** interface design	T1:12.3.4
49-50	A strategic approach to software testing, test strategies for conventional software, Black- Box and White-Box testing, Validation testing, system testing, the art of debugging.	**Demonstrate** testing techniques	T1:13.1
51-52	Software Quality, Frame work for productmetrics, Metrics for Analysis Model, Metrics for Design Model	**Explain** software quality	T1:15.1

53	Metrics for source code, metrics for testing, metrics for maintenance	**Demonstrate** metrics for testing	T1:15.5
54	Metrics for process and products: Software Measurement, Metrics for software quality	**Explain** metrics of software quality	T1:22.1
55	Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM plan.	**Demonstrate** RMMM	T1:25.1
56-58	Quality concepts, software quality assurance, Software Reviews, Formal technical Reviews	**Explain** quality concepts	T1:26.1
59-60	Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards	**Demonstrate** quality standards	T1:26.6

IX. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAMOUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Program outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO 1**	**PSO 2**	**PSO 3**
C314.1	3	1	1	1	3	0	0	0	0	0	3	2	3	0	2
C314.2	3	2	1	1	3	0	0	0	0	1	2	2	3	0	2
C314.3	3	2	2	1	3	0	0	0	0	0	0	2	3	0	2
C314.4	3	2	2	1	3	0	0	0	0	0	0	2	3	0	2
C314.5	3	2	2	1	3	0	0	0	0	0	0	2	3	0	2
Average	**3**	**1.83333**	**1.66667**	**1**	**3**	**0**	**0**	**0**	**0**	**1**	**1**	**2**	**3**	**0**	**2**

COMPUTER SCIENCE AND ENGINEERING

ASSIGNMENT

Course Name	:	**SOFTWARE ENGINEERING**
Course Code	:	2050513
Class	:	III B. Tech I Semester
Branch	:	Computer Science and Engineering
Year	:	2020 – 2021
Course Faculty	:	M Pallavi, Asst.Prof

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taughtthrough this question bank, which will enhance learner‟s learning process.

S. No	Question	Blooms Taxonomy Level	Course Outcome
	UNIT – I		
1	**Describe** “Software myth”? Discuss on various types of software myths andthe true aspects of these myths?	Remember	1
2	**Explain** software Engineering? Explain the software engineering layers?	Understand	1
3	**Explain** in detail the capability Maturity Model Integration (CMMI)?	Understand	1
4	**Describe** with the help of the diagram discuss in detail waterfall model. Givecertain reasons for its failure?	Understand	1
5	**Explain** briefly on (a) the incremental model (b) The RAD Model?	Understand	1
6	**Explain** the Spiral model in detail?	Understand	1
7	**Explain** unified process? Elaborate on the unified process work products?	Remember	1
8	**Explain** product and process are related?	Understand	1
9	**Explain** changing nature of software in detail?	Understand	1
10	**Explain** and contrast perspective process models and iterative process models?	Remember	1
11	**Explain** about the evolutionary process models ?	Remember	1
	UNIT – II		
1	**Compare** functional requirements with nonfunctional requirements?	Remember	1
2	**Explain** requirement engineering process?	Remember	1
3	**Discuss** briefly how requirement validation is done?	Remember	1

4	**Discuss** your knowledge of how an ATM is used, develop a set of usecases that could serve as a basis for understanding the requirements for an ATM system?	Understand	2
5	**Describe** four types of non-functional requirements that may be placed on a system. Give examples of each of these types of requirement?	Understand	2
6	**Explain** SRS document and explain along with its contents?	Understand	2
7	**Explain** interface specification in detail?	Understand	2
8	**Discuss** how requirements are felicitated and validated in software project?	Remember	2
9	**Discuss** how feasibility studies are important in requirement engineering process?	Remember	2
10	**Demonstrate** class hierarchy for library by using interface specification?	Remember	2
	UNIT – III		
1	**Explain** a two level process? Why should system design be finished before the detailed design, rather starting the detailed design after the requirements specification? Explain with the help of a suitable example	Understand	2
2	**Discuss** briefly the following fundamental concepts of software design: i) Abstraction, ii) Modularity, iii) Information hiding	Understand	2
3	**Explain** briefly the following: i) Coupling between the modules, ii) The internal Cohesion of a module	Understand	2
4	**Explain** software design? Explain data flow oriented design?	Understand	2
5	**Explain** the goals of the user interface design?	Remember	2
6	**Discuss** briefly about the golden rules for the user interface design?	Remember	2
7	**Discuss** architectural styles and patterns?	Remember	2
8	**Explain** with a neat diagram of architectural design?	Understand	2
9	**Explain** the guide lines of component level design?	Understand	2
10	**Describe** the way of conducting a component level design?	Understand	2
	UNIT – IV		
1	**Explain** about the importance of test strategies for conventional software?	Remember	3
2	**Discuss** black box testing in a detailed view?	Remember	3
3	**Compare** black box testing with white box testing?	Understand	3
4	**Compare** validation testing and system testing?	Remember	3

5	**Discuss** software quality factors? Discuss their relative importance?	Understand	3
6	**Explain** about Product metrics?	Understand	3
7	**Explain** in detail about Software Measurement?	Remember	3
8	**Explain** strategic approach to software testing	Understand	4
9	**Describe** test strategies for conventional software	Remember	3
10	**Discuss** a framework for product metrics	Understand	3
	UNIT – V		
1	**Explain** about software risks?	Remember	3
2	**Elaborate** the concepts of Risk management Reactive Vs Proactive Riskstrategies?	Understand	3
3	**Explain** about RMMM Plan?	Remember	3
4	**Explain** about Quality concepts?	Understand	3
5	**Explain** software quality assurance?	Understand	3
6	**Explain** about formal technical reviews?	Understand	3
7	**Explain** in detail ISO 9000 quality standards?	Understand	3
8	**Explain** six sigma for software engineering?	Remember	2
9	**Explain** quality management with their terms?	Understand	3
10	**Demonstrate** risk identification?	Remember	3

COMPUTER SCIENCE AND ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	**SOFTWARE ENGINEERING**
Course Code	:	2050513
Class	:	III B. Tech I Semester
Branch	:	Computer Science and Engineering
Year	:	2020 – 2021
Course Faculty	:	M Pallavi, Asst.Prof

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education.Themajor emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner‟s learning process.

S No	QUESTION	Blooms taxonomylevel	Course Outcomes
	UNIT – I **INTRODUCTION TO SOFTWARE ENGINEERING**		
	Part – A (Short Answer Questions)		
1	**Explain** is legacy software?	Knowledge	1
2	**Demonstrate** all the applications of software	Knowledge	1
3	**List** the types of software myths?	Knowledge	1
4	**Discuss** the architecture of layered technology	Understand	1
5	**List** all the umbrella activities in process framework	Understand	1
6	**Explain** process pattern?	Knowledge	1
7	**List** the types of software models	Understand	1

8	**Explain** the types other software process models	Understand	1
9	**Explain** software component? Explain its uses	Understand	1
10	**Explain** process assessment?	Knowledge	1
11	**Explain** the models in CMMI	Knowledge	1
12	**Explain** the levels in continuous model in CMMI	Understand	1
13	**Explain** the differences between perspective and iterative processmodels	Understand	1
14	**Explain** staged model in CMMI	Knowledge	1
15	**Explain** waterfall model and who invented waterfall model	Understand	1
16	**Explain** boehm model?	Understand	1
17	**List** the phases in unified process model	Understand	1
18	**List** the types of patterns	Knowledge	1
19	**Explain** PSP and TSP	Knowledge	1
20	**Explain** high speed adaptation model	Understand	1
Part – B (Long Answer Questions)			
1	**Explain** the evolving role of software	Knowledge	1
2	**Define** software and explain the various characteristics of software	Knowledge	2
3	**Explain** "Software myth"? Discuss on various types of software myths andthe true aspects of these myths	Knowledge	2
4	**Discuss** about software Engineering? Explain the software engineeringlayers?	Understand	2
5	**Explain** in detail the capability Maturity Model Integration (CMMI)	Understand	2
6	**Describe** with the help of the diagram discuss in detail waterfall model.Give certain reasons for its failure	Knowledge	2
7	**Explain** briefly on (a) the incremental model (b) The RAD Model	Understand	2
8	**Explain** the Spiral model in detail?	Understand	2
9	**Describe** With the help of the diagram explain the concurrent developmentmodel	Understand	2
10	**Explain** unified process? Elaborate on the unified process work products	Knowledge	3
11	**Explain** specialized process models	Knowledge	3
12	**Explain** different software applications?	Knowledge	3
13	**Explain** the paradigms do you think would be most effective? Why?	Understand	3
14	**Explain** product and process are related?	Understand	3
15	**Explain** personal and team process models	Understand	3

16	**Explain** process frame work activities	Knowledge	3
17	**Explain** the purpose of process assessment	Knowledge	3
18	**Explain** changing nature of software in detail	Knowledge	3
19	**Explain** and contrast perspective process models and iterative processmodels	Understand	3
20	**Explain** about the evolutionary process models	Understand	3
Part – C (Problem Solving and Critical Thinking Questions)			
1	**Describe** the law of conservation of familiarity in your own words	Knowledge	1
2	**Suggest** a few ways to build software to stop deterioration due to change	Knowledge	1
3	**Try** to develop a task set for the communication activity	Apply	2
4	**Explain** the purpose of process assessment? Why has SPICE beendeveloped as a standard for process assessment?	Knowledge	2
5	**Discuss** the meaning of "cross-cutting concerns" in your words	Knowledge	2

NIT – II **SOFTWARE REQUIREMENTS**			
Part – A (Short Answer Questions)			
1	**Explain** the kinds of system requirements	Knowledge	3
2	**Explain** functional requirement	Knowledge	3
3	**Explain** non-functional requirement	Understand	3
4	**Explain** domain requirements	Understand	3
5	**What** are kinds of non-functional requirements	Knowledge	3
6	**Explain** example of functional requirement	Understand	3
7	**Explain** user requirements in detail.	Understand	3
8	**Explain** system requirement in detail	Understand	3
9	**Explain** interface and list out how many types of there and what are they	Knowledge	3
10	**Explain** the term stake holder	Knowledge	3
11	**Explain** use case	Knowledge	3
12	**Explain** requirement validation	Understand	3
13	**Explain** requirement review	Understand	2
14	**Explain** data dictionary?	Understand	2
15	**Discuss** data flow model	Knowledge	2
16	**Explain** state machine model of a microwave oven	Knowledge	2
17	**List** kinds of behavioural and object models	Knowledge	2
18	**Design** class hierarchy for library by using in inheritance model	Knowledge	2
19	**Describe** ethnography	Understand	2
20	**Explain** viewpoints and types of view points	Understand	2
Part – B (Long Answer Questions)			
1	**Write** short notes on user requirements. What is requirements	Knowledge	3
2	**Compare** functional requirements with non-functional requirements	Knowledge	3
3	**Discuss** system requirements in a detail manner	Understand	3
4	**Explain** requirement engineering process.	Understand	3
5	**Discuss** briefly how requirement validation is done?	Knowledge	3

6	**Discuss** your knowledge of how an ATM is used , develop a set of use-cases that could serve as a basis for understanding the requirements for an ATM system.	Understand	3
7	**Describe** four types of non-functional requirements that may be placed on asystem. Give examples of each of these types of requirement.	Understand	3
8	**Explain** how requirements are managed in software project management	Understand	3
9	**Explain** context models	Knowledge	3
10	**Explain** Behavioural models.	Knowledge	3
11	**Explain** Data models.	Knowledge	3
12	**Explain** Object models	Understand	2
13	**Explain** in which circumstances would you recommend using structuredmethods for system development?	Understand	2
14	**Explain** SRS document and explain along with its contents	Understand	2
15	**Explain** interface specification in detail	Knowledge	2
16	**Discuss** how requirements are elicitated and validated in software project	Knowledge	2
17	**Discuss** how feasibility studies are important in requirement engineeringprocess.	Knowledge	3
18	**Demonstrate** class hierarchy for library by using interface specification	Understand	3
19	**Explain** inheritance model	Understand	3
20	**Explain** state machine model with a suitable example	Understand	3
Part – C (Problem Solving and Critical Thinking)			
1	**Identify** and briefly describe four types of requirements that may be definedfor computer based system	Knowledge	3
2	**List** out plausible user requirements for the following functions a) cash dispensing function in a bank ATM b) spelling check and correcting function in a word processor	Knowledge	3
3	**Suggest** how an engineer responsible for drawing up a system requirements specification might keep track of the relationship between functional and non-functional requirements.	Knowledge	3
4	**Suggest** who might be stakeholders in a university student record system. Explain why it is almost inevitable that the requirements of different stakeholders will conflict in some way.	Knowledge	3
5	**Explain** who should be involved in requirements review? Draw a processmodel showing how a requirements review might be organized.	Apply	3

UNIT-III **DESIGN ENGEERING**			
Part – A (Short Answer Questions)			
1	**Explain** why design is important in design engineering	Knowledge	3
2	**Discuss** analysis and design model	Understand	3
3	**Describe** quality attributes and its guidelines	Understand	3
4	**List** the design concepts	Knowledge	3
5	**Justify** the importance of refactoring	Understand	3
6	**Give** a short notes on low coupling	Understand	3
7	**Define** software architecture with its importance	Understand	3
8	**Explain** taxonomy of architectural styles	Knowledge	3
9	**Write** a short notes on architecture patterns	Knowledge	3
10	**Define** archetypes	Understand	3
11	**Define** component	Knowledge	2
12	**Write** a short notes on coupling	Knowledge	2
13	**List** out the steps for conducting component level design	Knowledge	2
14	**Write** a short notes on cohesion	Knowledge	2
15	**Design** the class based components	Understand	2
16	**List** out the golden rules for interface design	Understand	1
17	**Write** a short notes on interface design steps	Knowledge	1
18	**Describe** design evaluation	Knowledge	1
19	**List** out all the design issues	Understand	1
20	**Explain** process in user interface design	Understand	2
Part – B (Long Answer Questions)			
1	**Explain** a two level process? Why should system design be finished before the detailed design, rather starting the detailed design after the requirements specification? Explain with the help of a suitable example.	Knowledge	3
2	**Discuss** briefly the following fundamental concepts of software design: i) Abstraction ii) Modularity iii) Information hiding.	Understand	3
3	**Explain** briefly the following: a. Coupling between the modules b. The internal Cohesion of a module.	Understand	3
4	**Discuss** the fundamental principles of structured design. Write notes ontransform analysis.	Knowledge	2
5	**Explain** software architecture in a detail manner	Understand	2

6	**Explain** software design? Explain data flow oriented design	Understand	2
7	**What** are the goals of the user interface design	Understand	2
8	**Discuss** briefly about the golden rules for the user interface design	Knowledge	1
9	**Discuss** interface design steps in a brief manner	Knowledge	1
10	**Explain** how the design is evaluated	Understand	1
11	**Explain** design processing along with its quality	Knowledge	2
12	**What** are the design concepts in software engineering	Understand	2
13	**Explain** pattern based software design in a detail manner	Understand	2
14	**Elaborate** model for the design	Understand	1
15	**Discuss** architectural styles and patterns	Knowledge	1
16	**Explain** with a neat diagram of architectural design	Knowledge	1
17	**Elaborate** modeling component level design	Knowledge	1
18	**Describe** mapping data flow into a software architecture	Understand	2
19	**Explain** the guide lines of component level design	Understand	1
20	**Describe** the way of conducting a component level design	Understand	1
Part – C (Problem Solving and Critical Thinking)			
1	**State** how do we assess quality of a software design?	Knowledge	2
2	**Suggest** a design pattern that you encounter in a category of everydaythings.	Apply	2
3	**Provide** examples of three data abstractions and the procedural abstractionsthat can be used to manipulate them	Apply	2
4	**Explain** the difference between a data base that services one or moreconventional business applications and data warehouse	Knowledge	2
5	**Demonstrate** the architecture of a house or building as a metaphor, draw comparison with software architecture. How are the disciplines of classical architecture and software architecture similar? How do they differ?	Apply	2
UNIT-IV **TESTING STRATEGIES**			
Part – A (Short Answer Questions)			
1	**Compare** verification and validation	Knowledge	1
2	**Write** a short notes on unit testing	Knowledge	2
3	**Describe** smoke testing	Knowledge	2
4	**List** out the steps for bottom-up integration	Knowledge	2
5	**List** out the steps for top-down integration	Understand	2

6	**Write** short note on integration testing	Understand	2
7	**Define** alpha testing	Knowledge	2
8	**Define** beta testing	Knowledge	3
9	**Write** a short notes on validation testing	Knowledge	3
10	**Explain** art of debugging	Understand	2
11	**Describe** regression testing	Knowledge	2
12	**List** out the steps for integration step documentation	Knowledge	2

13	Describe performance testing	Knowledge	2
14	Write a short notes on glass box testing	Knowledge	2
15	Explain behavioral testing	Understand	2
16	List the quality factors of McCall‟s	Understand	2
17	List the quality factors of ISO 9126	Knowledge	2
18	Define the following terms measures, metrics, indicators	Understand	2
19	Give a short notes on product metric land scape	Understand	2
20	List out the metrics for analysis model	Understand	2
	Part – B (Long Answer Questions)		
1	**Explain** about the importance of test strategies for conventional software	Knowledge	1
2	**Discuss** black box testing in a detailed view	Apply	1
3	**Compare** black box testing with white box testing	Apply	1
4	**Compare** validation testing and system testing	Knowledge	1
5	**Discuss** software quality factors? Discuss their relative importance	Understand	1
6	**Discuss** an overview of quality metrics	Understand	1
7	**Explain** should we perform the Validation test – the software developer orthe software user? Justify your answer	Apply	1
8	**Explain** about Product metrics	Knowledge	1
9	**Explain** about Metrics for maintenance	Knowledge	1
10	**Explain** in detail about Software Measurement?	Understand	1
11	**Explain** about Metrics for software quality?	Knowledge	2
12	**Explain** strategic approach to software testing	Understand	2
13	**Describe** test strategies for conventional software	Understand	2
14	**Describe** validation testing	Understand	2

15	**Write** a long notes on system testing	Knowledge	2
16	**Demonstrate** art of debugging	Knowledge	2
17	**Discuss** a framework for product metrics	Knowledge	2
18	**Demonstrate** metrics for analysis model	Understand	2
19	**Briefly** list the metrics for the design model	Understand	2
20	**Describe** metrics for source code and for testing	Understand	1
Part – C (Problem Solving and Critical Thinking)			
1	**Provide** a few examples that illustrate why response time variability can bean issue.	Knowledge	2
2	**Develop** two additional design principles "place the user in control"	Apply	2
3	**Develop** two additional design principles "make the interface consistent"	Apply	2
4	**Develop** a complete test strategy for the safe home system. Document it in atest specification.	Apply	2
5	**Provide** examples for unit testing.	Apply	2
UNIT-V **RISK MANAGEMENT**			
Part – A (Short Answer Questions)			
1	**Define** reactive and proactive risk strategies	Knowledge	3
2	**List** out the generic subcategories of predictable risks	Understand	3
3	**Define** risk components	Understand	3
4	**List** out the conditions for risk refinement	Knowledge	3
5	**Demonstrate** quality concepts	Understand	3
6	**Give** a short notes on formal technical reviews	Understand	3
7	**List** out review guidelines	Understand	3
8	**Describe** six sigma for software	Knowledge	3
9	**Define** SQA plan	Knowledge	3
10	**Write** a short notes on ISO 9000 quality standards	Understand	2
11	**Give** the formulae for measures of reliability and availability	Knowledge	2
12	**Define** software safety	Knowledge	2
13	**Define** risk projection	Knowledge	2
14	**Define** software risks and what are the types of software risks	Knowledge	2

15	**Describe** risk components and drivers	Understand	2
16	**Define** risk refinement	Understand	2
17	**What** does RMMM stands in RMMM plan	Knowledge	2
18	**Define** software reliability	Understand	2
19	**Define** quality and quality control in quality management	Understand	2
20	**Give** a short notes on risk identification	Understand	3
Part – B (Long Answer Questions)			
1	**Explain** about software risks?	Knowledge	2
2	**Elaborate** the concepts of Risk management Reactive vs Proactive Riskstrategies	Understand	2
3	**Explain** about RMMM Plan?	Understand	2
4	**Explain** about Quality concepts?	Knowledge	2
5	**Explain** software quality assurance	Understand	2
6	**Explain** about formal technical reviews	Understand	2
7	**Explain** in detail ISO 9000 quality standards	Understand	2
8	**Discuss** risk refinement?	Knowledge	2
9	**Compare** reactive with proactive risk strategies	Knowledge	2
10	**Discuss** software reliability?	Understand	2
11	**Briefly** explain about formal approaches to SQA	Knowledge	3
12	**Demonstrate** statistical SQA	Understand	3
13	**Define** software reliability along with its terms	Understand	3
14	**Explain** risk projection in detail	Understand	3
15	**Explain** seven principals of risk management	Knowledge	3
16	**Explain** software reviews in brief	Knowledge	2
17	**Explain** six sigma for software engineering	Knowledge	2
18	**Explain** quality management with their terms	Understand	2
19	**Demonstrate** risk identification	Understand	2
20	**Describe** developing a risk table	Understand	1
Part – C (Problem Solving and Critical Thinking)			
1	Quality and reliability are related concepts but are fundamentally different innumber of ways**. Discuss** them	Apply	2
2	**Expalain** you have been given the responsibility for improving quality of software across your organization. What is the first thing that you should do?what‟s next	Apply	2

3	Some people argue that an FTR should assess programming style as well ascorrectness is this a good idea? **Discuss** why?	Apply	2
4	**Demonstrate is** it possible to assess the quality of software if the customerkeeps changing what it is supposed to do?	Apply	2
5	**Create** a risk table for the project that if you are the project manager for a major software company. you have been asked to lead a team that‟s developing “next generation “word-processing software.	Apply	1

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

COMPUTER SCIENCE AND ENGINEERING

COURSE DESCRIPTION FORM

Course Title	**FORMAL LANGUAGES AND AUTOMATA THEORY**			
Course Code	2050512			
Regulation	R20 – JNTUH			
Course Structure	Lectures	Tutorials	Practicals	Credits
	3	-	-	3
Course Faculty	D SHIVA RAMA KRISHNA, Asst.Prof			

I. COURSE OVERVIEW:

Formal languages and automata theory deals with the concepts of automata, formal languages, grammar, computability and decidability. The reasons to study Formal Languages and Automata Theory are AutomataTheory provides a simple, elegant view of the complex machine that we call a computer. Automata Theory possesses a high degree of permanence and stability, in contrast with the ever-changing paradigms of the technology, development, and management of computer systems. Further, parts of the Automata theory have direct bearing on practice, such as Automata on circuit design, compiler design, and search algorithms;Formal Languages and Grammars on compiler design; and Complexity on cryptography and optimization problems in manufacturing, business, and management. Last, but not least, research-oriented students will make good use of the Automata theory studied in this course.

II. PREREQUISITES:

Level	Credits	Periods / Week	Prerequisites
UG	3	5	Discrete mathematics, data structures and algorithms

III. MARKS DISTRIBUTION:

Sessional Marks	University End Exam marks	Total marks
Midterm Test There shall be two midterm examinations. Each midterm examination consists of essay paper. The essay paper is for 25 marks of 90 minutes duration and shall contain PART-A and PART-B. PART-A of 10 marks, It consists 10 questions student has to answer all questions each carries 1 Mark, PART-B of 15 marks, It contains 3 questions with internal choice, each question carries 5 marks.	70	100

IV. EVALUATION SCHEME:

S. No	Component	Duration	Marks
1	I Mid Examination	90 minutes	25
2	I Assignment	-	05
3	II Mid Examination	90 minutes	25
4	II Assignment	-	05
5	External Examination	3 hours	70

V. COURSE OBJECTIVE :

Understand an overview of the theoretical foundations of computer science from the perspective of formallanguages

II. Illustrate finite state machines to solve problems in computing

III. Understand the hierarchy of problems arising in the computer sciences.

IV. Understand Regular grammars, context free grammar.

V. Construct the model of Push down Automata, Turing Machines.

VI. COURSE OUTCOMES:

At the end of the course the student will develop ability to

CO	Course outcome	Blooms taxonomy level
C313.1	Understandtheconceptof abstract machinesandtheirpowertorecognizethelanguages.	Remember
C313.2	Employfinite statemachinesformodelingandsolvingcomputingproblems.	Analyse
C313.3	Designcontextfreegrammarsforformal languages.	Analyse
C313.4	Gainproficiencywithmathematicaltoolsandformalmethods.	Create
C313.5	Classifymachinesbytheirpowerto recognizelanguages.	Understand

VIII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes	Level	Proficiency assessed by
Applications of Computing: Ability to use knowledge in various domains to provide solution to new ideas and innovations.	H	Lectures, Assignments
Programming Skills: Identify required data structures, design suitable algorithms,develop and maintain software for real world problems.	H	Projects

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IX.SYLLABUS:

UNIT I:

Fundamentals:Strings, Alphabets, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automation and non deterministic finite automaton, transition diagrams and language recognizers.

Finite automata:NFA with ε transitions – Significance, acceptance of languages. Conversions and Equivalence : Equivalence between NFA with and without ε – transitions. NFA to DFA conversion, minimization of FSM, equivalence between two FSM‟s, Finite Automata with output
– Moore and Melay machines.

UNIT II:

Regular Languages:Regular sets, regular expressions, identify rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets(proofs not required)

Grammar Formalism:Regular grammars – right linear and left linear grammars, equivalencebetween regular linear grammar and FA, inter conversion, Context free grammar , derivationtrees, sentential forms. Right most and left most derivation of strings.

UNIT III:

Context Free Grammars :Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted).

Push Down Automata:Push down automata, definition , model, acceptance of CFL, Acceptanceby final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion.(Proofs not required). Introduction to DCFL and DPDA.

UNIT IV:

Turing Machine :Turing Machine, definition, model , design of TM, Computable functions, recursively enumerable languages. Church‟s hypothesis , counter machine , types of Turing machines(proofs not required).linear bounded automata and context sensitive language.

UNIT V:

Computability Theory :Chomsky hierarchy of languages, decidability of problems, Universal Turing Machine, undecidability of posts. Correspondence problem, Turing reducibility, Definitionof P and NP roblems, N complete and NP hard problems.

TEXT BOOKS:

1. “Introduction to Automata Theory Languages and Computation”.Hopcroft H.E. and UllmanJ.D.Pearson Education.

2. Introduction to Theory of Computation –Sipser 2nd edition Thomson

REFERENCES

1. Theory of Computation – Vivek Kulkarni - OXFORD
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. Introduction to languages and the Theory of Computation ,John C Martin, TMH
4. Theory of Computer Science – Automata languages and computation – Mishra andChandrashekaran, 2nd edition, PHI
5. "Elements of Theory of Computation", Lewis H.P. & Papadimition C.H. Pearson /PHI

X. COURSE PLAN:

The course plan is meant as a guideline. There may probably be changes.

Lecture No.	Topics to be covered	Course Learning Outcomes	Reference
1 – 2	**Fundamentals :** Strings, Alphabet, Language, Operations	**Understand** Fundaments	T1: 1.1-1.2 R1: 1.2 – 1.3
3	Finite state machine, definitions, finite automaton model, acceptance of strings, and languages	**Understand** Finite state machine	T1:2.1 -2.2 R1: 2.2 – 2.3
4 – 5	Deterministic finite automaton.	**Illustrate** Deterministic finite automaton	T1:2.2 R1: 2.4
6 -7	Non deterministic finite automaton	**Illustrate** Non deterministic finite automaton	T1:2.3 R1: 2.5
8	Transition diagrams and Language recognizers	**Illustrate** Transition diagrams	T1:2.2 R1: 2.2 -2.3
9 – 10	**Finite Automata :** Non deterministic finite automaton with ε transitions - Significance, acceptance of languages.	**Illustrate** Non deterministic finite automaton with ε transitions	T1:2.4 R1: 2.7
11	Conversions and Equivalence : Equivalence between NFA with and without ε transitions	**Illustrate** NFA with ε to NFA conversions	T1:2.4 R1: 2.8
12 – 13	NFA to DFA conversion	**Illustrate** NFA to DFA conversion	T1:2.3 R1: 2.6.1
14 – 15	Minimization of Finite state machine	**Understand** Minimization of Finite state machine	T1:3.4 R1: 2.6.2 , 2.13
16	Equivalence between two Finite state machine‟s	**Illustrate** Equivalence between two Finite state machine‟s	T1:3.4 R1: 2.12
17 – 18	Finite Automata with output- Moore and Melay machines	**Illustrate** Finite Automata without machines.	T1:2.7 R1: 2.10
19	**Regular Languages :** Regular sets, regular	**Understand** Regular languages	T1:2.5

	expressions, identity rules,		R1: 3.2 -3.3
20 – 21	Constructing finite Automata for a given regular expressions	**Illustrate** Constructin g Finit	T1:2.5 R1: 3.4
22	Conversion of Finite Automata to Regular expressions.	**Illustrate** Conversion of finite automaton to Regular expressions	T1:2.5 R1: 3.4
23	Pumping lemma of regular sets	**Understand** Pumping lemma	T1:3.1 R1: 3.6
24	Closure properties of regular sets (proofs not required).	**Understand** Closure properties	T1:3.2 R1:3.5.2
25	**Grammar Formalism :** Regular grammars-right linear and left linear grammars	**Understand** Regular Grammars	T1:9.1 R1: 5.11.4
26 – 27	Equivalence between regular linear grammar and Finite Automata, inter conversion	**Illustrate** Equivalence of regular linear grammar & Finite Automata	T1:9.1 R1: 5.12 – 5.13
28	Context free grammar, derivation trees	**Understand** Context free grammar	T1:4.2 R1: 5.6 , 5.7
29	Sentential forms, Right most and leftmost derivation of strings	**Illustrate** Derivation of strings	T1:4.3 R1: 5.5
30	**Context Free Grammars:** Ambiguity in context free grammars.	**Understand** Ambiguity in context free grammars	T1:4.3 R1: 5.8
31	Minimization of Context Free Grammars.	**Understand** Minimization	T1:4.4 R1: 5.9
32	Chomsky normal form	**Understand** Chomsky normal form	T1:4.5 R1: 5.10.1
33	Greiback normal form	**Understand** Greiback normal form	T1:4.6 R1: 5.10.2
34	Pumping Lemma for Context Free Languages.	**Understand** Pumping Lemma	T1:6.1 R1: 5.14
35	Enumeration of properties of CFL (proofs	**Understand** Context Free Langua ge	T1:6.2

	omitted).	properties	R1: 6.8
36 -40	**Push Down Automata** Push down automata, definition, model, acceptance of CFL. Acceptance by final state and acceptance by empty state and its equivalence.	**Understand** Push down automata	T1:5.2 R1: 6.2 – 6.3 T1:5.2 R1: 6.5
40 – 41	Equivalence of CFL and PDA, inter conversion. (Proofs not required).	**Understand** Equivalences	T1:5.3 R1: 6.7
42	Introduction to DCFL and DPDA	**Illustrate** DCFL,DPDA	T1:10.1 – 10.2 R1: 6.6
43- 46	**Turing Machine :** Turing Machine, definition, Model, design of TM	**Understand** Turing machines	T1:7.2 R1: 4.2 – 4.3 T1:7.2 R1: 4.4 – 4.5
47 -49	Computable functions	**Illustrate** Computable functions	T1:7.3 R1: 4.6
50	Recursively enumerable languages.	**Understand** Recursively enumerable languages	T1:7.3 , 8.2 R1: 4.15
51	Church‟s hypothesis, counter machine	**Understand** Cchurch‟s hypothesis	T1:7.6 R1: 4.17
52	Types of Turing machines (proofs not required)	**Illustrate**Types of Turing machines	T1:7.5 R1: 4.8 – 4.12
53 – 54	**Computability Theory :** Chomsky hierarchy of languages, Linear bounded automata and context sensitive languages	**Understand** Chomskyhierarchy	T1:9.1 – 9.4 R1: 5.11 T1:9.3 R1: 4.20, 5.11.2
55 – 56	LR(0) grammar, decidability of, problems	**Illustrate** LR(0)	T1:10.6

			R1: 7.5.1
57	Universal Turing Machine	**Understand** Universal TuringMachine	T1:8.3 R1: 4.9
58 – 60	Undecidability of posts. Correspondence problem,Turing reducibility, Definition of P and NP problems,NP complete and NP hard	**Understand** PCP, P, NP, NPcomplete problems	T1:8.5| R1: 4.18 T1:13.1 T1:13.2

XI. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAMS:

Program outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	PSO 3
C313.1	3	3	1	1	0	0	0	0	0	0	0	0	2	0	0
C313.2	3	3	3	3	3	0	0	0	0	0	0	0	3	1	2
C313.3	3	3	2	3	0	0	0	0	0	0	0	0	3	1	2
C313.4	3	3	2	3	3	0	0	0	0	0	0	0	3	1	2
C313.5	3	3	3	3	3	0	0	0	0	0	0	0	3	1	2
Average	**3**	3	2.2	2	3								2.8	1	2

ASSIGNMENT

Course Name	:	**FORMAL LANGUAGES AND AUTOMATA THEORY**
Course Code	:	2050512
Class	:	III B. Tech I Semester
Branch	:	Computer Science and Engineering
Year	:	2020 – 2021
Course Faculty	:	D SHIVA RAMA KRISHNA, Asst.Prof

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead inincorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner‟s learning process.

S. No.	Question	Blooms Taxonomy Level	Course Outcome
	UNIT – I		
1	**Construct** NFA for (0+1)*0(0+1)0(0+1)* and convert to DFA.	Apply	2
2	**Construct** NFA for (0+1)*010(0+1)* and Convert to DFA.	Apply	2
3	**Construct** NFA with Ɛ for 0*1*2* and Convert to NFA .	Apply	2
4	**Explain** the steps for the minimization of given DFA with an example.	Understand	2
5	**Construct** Mealy Machine for Residue Modulo of 5 for the ternary number system and convert to Moore Machines.	Apply	2
6	**Define** language over an alphabet with examples. Write a DFA to accept set of all strings ending with 010.	Remember	2
7	**Give** example for Minimize the DFA .	Understand	2
8	**Construct** a Moore machine to accept the following language. L = { w |w mod 3 = 0} on ∑ = { 0,1,2}	Apply	3
9	**Write** any four differences between DFA and NFA	Apply	2
10	**Convert** NFA with Ɛ to NFA with an example.	Understand	2

UNIT – II

1	**Explain** Identity rules . Give an example using the identity rules for the simplification	Remember	3
2	**Construct** Regular grammar for the given Finite Automata	Apply	3
3	**Convert** given Finite Automat to Regular Expression using standard method(R_{ij}^{K} method)	Understand	3
4	**Convert** Regular Expression ab* + b to Finite Automata.	Understand	3
5	**Convert** given Finite Automat to Regular Expression using Arden"s theorem.	Understand	1
6	**Use** G be the grammar S aB bA A a aS bAA B b bS aBB For the string aaabbabbba , Find a. Leftmost Derivation. b . Rightmost Derivation. c. Derivation Tree.	Apply	1
7	**Convert** Regular Expression (bb + a)*(aa + b)* to NFA with ε.	Understand	1
8	**Construct** Regular Grammars for Finite Automata a*(b (a + b))* .	Apply	1
9	**Construct** Finite Automata for A0 a A1 A1 b A1 A1 a A1 bA0.	Apply	2
10	**Convert** Regular Expression (a + b)*(aa + bb)(a + b)* to DFA.	Understand	2

	UNIT - III		
1	**Discuss** the Pumping lemma for Context Free Languages concept with example.	Understand	3
2	**Show** that the following grammar is ambiguous with respect to the string aaabbabbba. S → aB | bA A → aS| bAA| a B → bS | aBB | b	Understand	3
3	**Use** the following grammar : S → ABC | BbB, A → aA | BaC|aaa B → bBb| a|D C→CA|AC D → ε Eliminate ε-productions. Eliminate any unit productions in the resulting grammar. Eliminate any useless symbols in the resulting grammar. Convert the resulting grammar into Chomsky Normal Form (CNF).	Apply	4
4	**Convert** the following grammar to GNF A1 →A2 A3 A2 → A3 A1 /b A3→ A1 A2 /a	Understand	4
5	**Write** the procedure to convert CFG to PDA and also convert the following CFG to PDA. PDA. S → aABB | aAA A → aBB | a B → bBB | A C → a	Apply	3
6	**Construct** PDA for equal number of x‟s and y‟s	Apply	2
7	**Convert** the following PDA to CFG δ(q0,0,z0)={q0,xz0) δ(q0,0,x)=(q0,xx)	Understand	1

	$\delta(q0,1,x)=(q1,\epsilon)$ $\delta(q1,1,x) = (q1,\epsilon)$ $\delta(q1,\epsilon,x)=(q1,\epsilon)$ $\delta(q1,\epsilon,z0)=(q1,\ )$		
8	**Construct** a PDA to accept the language $L = \{a^n b^n \mid n >= 1\}$ by a final state. Draw the graphical representation of the PDA. Also show the moves made by PDA for the string aaabbb	Apply	1
9	**Construct** NPDA for $L = \{ W W^R / W \epsilon (X + Y)^*\}$ M = ({q1,q2},{0,1}.{R,B,G},δ,q1,R, }	Apply	2
10	**Show** that the following CFG ambiguous. S iCtS | iCtSeS | a C b	Understand	2
	UNIT – IV		
1	**Construct** a Turing Machine to accept the language $L= \{ ww^R \mid w \in (0 + 1)^*\}$	Apply	3
2	**Construct** Turing Machine that accepts the language a $L = \{a^n b^n \mid n \geq 1\}$. Give the transition diagram for the Turing Machine obtained	Apply	3
3	**Construct** a Turing Machine which shift non block symbols 2 cells to the right.	Apply	1
4	**Construct** a Turing Machine that accepts the language $L = \{0^n 1^n \mid n \geq 1\}$. Give the transition diagram for the Turing Machine obtained and also show the moves made by the Turing machine for the string 000111.	Apply	1
5	**Define** a Turing Machine. With a neat diagram explain the working of a Turing Machine.	Remember	1
6	**Define** Recursive and Recursively Enumerable languages? Write the properties of recursive and recursively enumerable languages.	Remember	1
7	**Construct** a Turing Machine that gives two‟s compliment for the given binary	Apply	2

	representation.		
8	**Construct** a Turing Machine that accepts the language L = $\{0^{2n}1^n \mid n \geq 0\}$. Give the transition diagram for the Turing Machine obtained.	Apply	2
9	**Construct** a Turing Machine that accepts the language L = $\{1^n2^n3^n \mid n \geq 1\}$. Give the transition diagram for the Turing Machine obtained and also show the moves made by the Turing machine for the string 111222333.	Apply	2
10	**Construct** a Turing Machine to implement Subtraction (m-n).	Apply	3
	UNIT – V		
1	**Explain** the concept of undecidability problems about Turing Machine	Remember	3
2	**Write** a short notes on Context sensitive language and linear bounded automata	Apply	2
3	**Explain** individually classes P and NP	Remember	2
4	**Write** a shot notes on post's correspondence problem	Apply	2
5	**Explain** the Halting problem with an example. Write a short notes on universal Turing machine.	Apply	1
6	**Construct** LR(0) for A □ aAa/B B□b	Apply	1
7	**Write** a short notes on Chomsky hierarchy	Apply	1
8	**Write** a note on Modified PCP and Multi stack Turing machine.	Apply	2
9	**Write** a short notes on NP complete , NP hard problems	Apply	2
10	**Construct** LR(0) for S □ E E □ E*B	Apply	1

	E □E + B		

TUTORIAL QUESTION BANK

Course Name	:	**FORMAL LANGUAGES AND AUTOMATA THEORY**
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Group - A (Short Answer Questions)

S. No.	Questions	Blooms Taxonomy Level	Course Outcomes
	UNIT - I		
1.	**Explain** transition diagram, transition table with example.	Understand	1
2.	**Define** transition function of DFA.	Remember	2
3.	**Define** ε –transitions.	Remember	2
4.	**Construct** a DFA to accept even number of 0‟s.	Apply	2
5.	**Define** Kleene closure.	Remember	1
6.	**Construct** a DFA to accept empty language.	Apply	2
7.	**Explain** power of an alphabet (∑*)?	Understand	1
8.	**Write** transition diagram for DFA accepting string ending with 00.	Apply	2
9.	**Write** transition diagram for DFA to accept exactly one a.	Apply	2
10.	**Define** the language of NFA.	Remember	2
11.	**Explain** the different Operations on the languages.	Understand	
12.	**Construct** a finite automaton accepting all strings over {0, 1}	Apply	2

	having even number of 0"s		
13.	**Define** Moore Machines.	Remember	3
14.	**Define** Mealy Machines.	Remember	3
15.	**Write** DFA for odd number of 1"s.	Apply	2
16.	**Write** NFA for (0+1)*101(0+1)*.	Apply	2
17.	**Write** DFA for (0+1)*10(0+1)*.	Apply	2
18.	**Define** ε - closure.	Remember	2
19.	**Write** NFA for (0+1)*001(0+1)*.	Apply	2
20.	**Write** DFA for (0+1)*00(0+1)*.	Apply	2
	UNIT – II		
1.	**Define** Regular Languages.	Remember	1
2.	**Define** Pumping Lemma for Regular Languages.	Remember	1
3.	**Write** the applications of pumping lemma for regular languages.	Apply	1
4.	**List** any two applications of regular expression.	Remember	1
5.	**Define** Context Free Grammars.	Remember	1
6.	**Define** Left linear derivation.	Remember	1
7.	**Write** regular expression for denoting language containing empty string.	Apply	1
8.	**Differentiate** left linear and right linear derivations.	Understand	2
9.	**Write** the Context free grammar for palindrome.	Remember	2
10.	**Define** right linear grammars.	Remember	2
11.	**Define** Regular grammars.	Remember	2
12.	**Write** regular expressions for the Set of strings over {0, 1} whose last two symbols are the same.	Apply	2
13.	**Define** right linear derivation.	Remember	3
14.	**Define** left linear grammars.	Remember	3
15.	**Write** the regular language generated by regular expression (0+1)*001(0+1)*.	Apply	3
16.	**Write the** Regular Expression for binary strings. the set of	Apply	3
17.	**Write** the the aaa from CFG – derivation of string a	Apply	4

	S □ a A □ a S/A		
18.	**Write** the derivation of the string 110 from CFG – S□ A0/B A□0/12/B B □A/11	Apply	1
19.	**Write** the Regular Expression to generate atleast one b over Σ ={a,b}	Apply	1
20.	**Write** the Context free grammar for equal number of a‟s and b‟s.	Apply	1
	UNIT – III		
1.	**Define** Greibach normal form.	Remember	1
2.	**Define** nullable Variable.	Remember	1
3.	**Write** the minimized CFG for the following grammar S□ ABCa | bD A□BC |b B□b | ε C□ Đ | εD□d	Remember	2
4.	**Convert** the grammar to CNF - S □bA/aB A□aS/a B□bS/b.	Understand	2
5.	**Explain** the elimination of UNIT production.	Understand	3
6.	**Explain** the elimination of useless symbols in productions.	Understand	4
7.	**Define** CNF.	Remember	3
8.	**Write** the minimization of CFG – S □ a S/A A □a B □ aa	Understand	3
9.	**Define** the ambiguity in CFG.	Remember	3
10.	**What** is the use of CNF and GNF.		3
11.	**Write** the minimization of CFG - S □ aS1b S1□aS1b/ε.	Understand	3
12.	**Write** the minimization of CFG - S □ A A □aA/ ε.	Understand	3
13.	**Write** the minimization of CFG - S □AB / a A □ a.	Understand	3
14.	**Write** the minimization of CFG - S□aS/A/C A □ a B □ aa C □ aCb.	Understand	3
15.	**Write** the minimization of CFG - S□AbA A□ Aa/ ε.	Understand	3
16.	**Write** the minimization of CFG - S□aSa S □bSb S□a/b/ ε.	Understand	3

17.	**Write** the minimization of CFG - S□ A0/B A□0/12/B B □A/11.	Understand	3
18.	**Convert** the grammar to CNF - S□aSa/aa S□bSb/bb S □a/b.	Understand	2
19.	**Convert** the grammar to CNF - S□aAbB A□aA/a B□bB/a.	Understand	2
20.	**Define** PDA.	Remember	2
21.	**Define** NPDA.	Remember	2
22.	**Differentiate** between deterministic and nondeterministic PDA.	Understand	2
23.	**Define** the language of DPDA.	Remember	2
	List the steps to convert CFG to PDA.	Remember	2
25.	**Explain –** acceptance of PDF by final state.	Understand	2
26.	**Explain –** acceptance of PDF by empty stack.	Understand	2
27.	**Convert** the following PDA to CFG δ(q0,b,z0)={q0,zz0)	Apply	2
28.	**Convert** the following PDA to CFG δ(q0, b, z)=(q0,zz)	Apply	1
29.	**Convert** the following PDA to CFG δ(q0, ϵ ,z0)=(q0,ϵ)	Apply	1
30.	**Convert** the following PDA to CFG δ(q0,a,z) = (q1,z)	Apply	1
31.	**Convert** the following PDA to CFG δ(q1,b,z)=(q1,ϵ)	Apply	2
32.	**Convert** the following PDA to CFG δ(q1,a,z0)=(q0,z0)	Apply	2
33.	**Convert** the following PDA to CFG δ(q0,0,z0)={q0,xz0)	Apply	2
34.	**Convert** the following PDA to CFG δ(q0,0,x)=(q0,xx)	Apply	2
35.	**Convert** the following PDA to CFG δ(q0,1,x)=(q1,ϵ)	Apply	3
36.	**Convert** the following PDA to CFG δ(q1,1,x) = (q1,ϵ)	Apply	4
37.	**Convert** the following PDA to CFG δ(q1,ϵ,x)=(q1,ϵ)	Apply	1
38.	**Convert** the following PDA to CFG δ(q1,ϵ,z0)=(q1,ϵ)	Apply	1
39.	**Convert** the following PDA to CFG δ(q1,ϵ,z)=(q0,ϵ)	Apply	1
40.	**Convert** the following CFG to PDA S□ □ ABC | BbB	Apply	1
41.	**Convert** the following CFG to PDA A□ □ aA | BaC|aaa	Apply	1
42.	**Convert** the following CFG to PDAC□CA|AC C□CA|AC	Apply	1
43	**Convert** the following CFG to PDAS □ a S/A	Apply	1

UNIT-IV			
1.	**Define** Turing Machine	Apply	2
2.	**Explain** the moves in Turing Machine.	Understand	2
3.	**Define** an ID of a Turing Machine.	Remember	2
4.	**Define** the Language of Turing Machine.	Remember	3
5.	**List** types of TM.	Remember	3
6.	**Define** Computable Functions by Turing Machines .	Remember	3
7.	**Write** the difference between Pushdown Automata and TuringMachine.	Apply	4
8.	**Explain** Church‟s Hypothesis.	Understand	1
9.	**Define** Context sensitive language.	Remember	1
10.	**Define** multi head Turing Machine.	Remember	1
11.	**Define** multi dimensional Turing Machine.	Remember	2
12.	**Define** multiple tapes Turing Machine.	Remember	2
13.	**Define** Recursive languages.	Remember	3
14.	**Define** Recursively enumerable languages.	Remember	3
15.	**Define** Two way infinite Turing Machine.	Remember	4
16.	**Define** Non deterministic Turing Machine.	Remember	4
17.	**Define** Counter machine .	Remember	1
18.	**Construct** Turing Machine for (0+1)*.	Remember	2
19.	**Construct** Turing Machine for 1‟s complement for binary numbers.	Remember	4
20.	**Differentiate** Recursive languages and Recursively enumberable languages.	Remember	2
UNIT V			

1.	**Define** Chomsky hierarchy of languages.	Remember	3
2.	**Define** Universal Turing Machine	Remember	3
3.	**Define** MPCP.	Remember	3
4.	**Define** decidability.	Remember	1
5.	**Define** P problems.	Remember	1
6.	**Define** Universal Turing Machines	Remember	4
7.	**Give** examples for Undecidable Problems	Understand	4
8.	**Define** Turing Machine halting problem.	Remember	4
9.	**Define** Turing Reducibility	Remember	4
10.	**Define** PCP.	Remember	4
11.	**Define** Type 0 grammars .	Remember	3
12.	**Define** Type 1 grammars .	Remember	3
13.	**Define** Type 2 grammars .	Remember	3
14.	**Define** Type 3 grammars .	Remember	3
15.	**Define** NP problems.	Remember	2
16.	**Define** NP complete problems	Remember	2
17.	**Define** NP Hard problems	Remember	2
18.	**Define** undecidability.	Remember	1
19.	**Define** Reducibility.	Remember	2
20.	**List** the types of grammars.	Remember	4

2. Group - II (Long Answer Questions)

S. No.	Questions	Blooms Taxonomy Level	Course Outcomes
	10 Marks Questions		
	UNIT - I		
1.	**Construct** a DFA to accept set of all strings ending with 010. Define language over an alphabet and write for the above DFA .	Apply	2

2.	**Construct** a Moore machine to accept the following language. L = { w |w mod 3 = 0} on ∑ = { 0,1,2}	Apply	3
3.	**Write** any four differences between DFA and NFA	Apply	2
4.	**Write** NFA with Ɛ to NFA conversion with an example.	Understand	2
5.	**Construct** NFA for (0 + 1)*(00 + 11)(0 + 1)* and Convert to DFA.	Apply	2
6.	**Construct** NFA for (0 +1)*(00 + 11)(0 + 1)* and Draw the transition table and transition diagram and example strings.	Apply	2
7.	**Construct** Mealy machine for (0 + 1)*(00 + 11) and convert to Moore machine.	Apply	3
8.	**Convert** NFA with Ɛ – a*b* to NFA.	Understand	2
9.	**Construct** NFA for (0 + 1)*101 and Convert to DFA.	Apply	2
10.	**Conver**t Moore machine to Mealy machine with an example.	Understand	3
11.	**Construct** a DFA, the language recognized by the Automaton being *L* {*a*^{n}*b*/*n* ≥ 0}. Draw the transition table.	Apply	2
12.	**Construct** the DFA that accepts/recognizes the language *L*(*M*) = {*w* | *w* ∈ {*a*, *b*, *c*}* and *w* contains the pattern *abac* }. Draw the transition table.	Apply	2
13.	**Differentiate** between DFA and NFA with an example.	Understand	2
14.	**Construct** a finite automaton accepting all strings over {0, 1} having even number of 0"s and even number of 1"s.	Apply	2
15.	**Construct** a Moore Machine to determine the residue mod 5 for each binary string treated as integer. Sketch the transition table.	Apply	3
16.	**Convert** Mealy machine for (0 + 1)*(00 + 11) to Moore machine.	Understand	3
	UNIT - II		
1.	**Convert** Regular Expression 01* + 1 to Finite Automata.	Understand	1
3.	**Construct** Right linear , Left linear Regular Grammars for 01*+1.	Apply	2
4.	**Explain** Identity rules . Simplify the Regular Expression - Є + 1*(011)*(1*(011)*)*	Understand	1
5.	**Construct** Regular grammar for the given Finite Automata. (a+b)*ab*.	Apply	3
6.	**Construct** Leftmost Derivation. , Rightmost Derivation, Derivation Tree for the following grammar S → aB → bA	Apply	4

	A□ □ a □ aS □ bAA B□ □ b □ □ bS □ aBB For the string aaabbabbba .		
7.	**Explain** the properties, applications of Context Free Languages	Understa nd	1
8.	**Construct** right linear and left linear grammars for given Regular Expression.	Apply	1
9.	**Construct** a Transition System M accepting L(G) for a given Regular Grammar G.	Apply	1
10.	**Discuss** the properties of Context free Language. Explain the pumping lemma with an example.	Understand	2
12.	**Construct** a NFA with Є equivalent to the regular expression 10 + (0 + 11)0*1	Apply	2
13.	**Construct** Leftmost Derivation. , Rightmost Derivation, Derivation Tree for the following grammar $G = (V, T, P, S)$ with $N = \{E\}$, $S = E$, $T = \{id, +, *, (,)\}$ E□ E+E E□ E*E E□ (E) E□ id Obtain id+id*id in right most derivation, left most derivation	Apply	2
14.	**Write** a CFG that generates equal number of a‟s and b‟s.	Apply	2
15.	**Convert** G = ({S},{a},{ S □ aS /a},{S}) into FA	Understan d	3
16.	**Construct** a Regular expression for the set all strings of 0‟s and 1‟s with at least two consecutive 0‟s	Apply	1
17.	**Construct** context free grammar which generates palindrome strings ∑={a,b}	Apply	1
18.	**Construct** equivalent NFA with ϵ for the given regular expression 0*(1(0+1))*.	Apply	2
20.	**Write** 12 identity rules for regular expressions	Apply	2
	UNIT – III		
1.	**Write** a short notes on Chomsky Normal Form and Griebach Normal Form.	Apply	1
2.	**Show** that the following grammar is ambiguous with respect to the	Understand	1

	string aaabbabbba. S → aB | bA A → aS| bAA| a B → bS | aBB | b		
3.	**Use** the following grammar : S → ABC | BbB A → aA | BaC|aaa B → bBb| a|D C→CA|AC D → ε Eliminate ε-productions. Eliminate any unit productions in the resulting grammar. Eliminate any useless symbols in the resulting grammar. Convert the resulting grammar into Chomsky Normal Form	Apply	1
4.	**Illustrate** the construction of Griebach normal form with an example.	Apply	1
5.	**Show** that the following CFG ambiguous. S → iCtS | iCtSeS | a C → b	Apply	1
6.	**Discuss** the Pumping lemma for Context Free Languages concept with example $\{a^n b^n c^n$ where $n>0\}$	Understand	1
7.	**Write** the simplified productions in S → a S1b CFG S1 → a S1b/ Є	Apply	1
8.	**Convert** the following CFG into GNF. S→AA/a A → SS/b	Understand	1
9.	**Explain** unit production? Explain the procedure to eliminate unit production.	Understand	2
10.	**Explain** the procedure to eliminate ϵ-productions in grammar.	Understand	2
11.	**Convert** the following grammar into GNF G=({A1,A2,A3},{a,b},P ,A) A1->A2A3 A2->A3A1/b A3->A1A2/a	Understand	2
12.	**Write** simplified CFG productions from the following grammar	Apply	2

	A->aBb/bBa B->aB/bB/ϵ		
13.	**Convert** the following grammar into GNF S->ABA/AB/BA/AA/B A->aA/a B->bB/b	Understand	2
14.	**Convert** the following grammar into CNF S->aAbB A->aA/a B->bB/b	Understand	1
15.	**Write** the GNF equivalent to the following grammar S->XA/BB B->b/SB X->b A->a	Apply	2
16.	**State** the following grammar is ambiguous. S-> AB|aaB A->a / Aa B->b	Remember	1
17.	**Construct** NPDA for L = { W W^R /W ϵ (0 + 1)*} M = ({q1,q2},{0,1}.{R,B,G},δ,q1,R,ϕ}	Apply	1
18.	**Write** the procedure to convert from the given PDA to a CFG. Convert the following example. δ(q0,b,z0)={q0, zz0) δ(q0, b, z)=(q0,zz) δ(q0, ϵ ,z0)=(q0,ϵ) δ(q0,a,z) = (q1,z) δ(q1,b,z)=(q1,ϵ) δ(q1,a,z0)=(q0,z 0)	Apply	1
19.	**Write** the procedure to convert CFG to PDA and also convert the following CFG to PDA.	Apply	3

	S → B | aAA A → aBB | a B → bBB|A C → a		
20.	**Construct** a PDA to accept the language L ={ $a^n b^n$ | n >= 1} by a final state. Draw the graphical representation of the PDA. Also show the moves made by the PDA for the string aaabbb	Apply	3
	UNIT – IV		
1.	**Define** a Turing Machine. With a neat diagram explain the working of a Turing Machine.	Remember	4
2.	**Construct** a Transition table for Turing Machine which shift non block symbols 3 cells to the right.	Apply	4
3.	**Construct** a Transition diagram for Turing Machine to accept the following language. L = { $0^n1^n0^n$ | n ≥1}	Apply	4
4.	**Construct** Transition diagram for Turing Machine that accepts the language L = {0^n1^n | n ≥1}. Give the transition diagram for the Turing Machine obtained and also show the moves made by the Turing machine for the string 000111.	Apply	4
5.	**Construct** a Transition diagram for Turing Machine to accept the language L= { w#w^R | w ϵ (a + b) *}	Apply	3
6.	**Write** short notes on Recursive and Recursively Enumerable languages.	Apply	2
7.	**Write** the properties of recursive and recursively enumerable languages.	Apply	2
8.	**Construct** a Turing Machine to accept strings formed with 0 and 1 and having substring 000.	Apply	2
9.	**Construct** a Turing Machine that accepts the language L = {$1^n2^n3^n$ | n ≥1}. Give the transition diagram for the Turing Machine obtained and also show the moves made by the Turing machine for the string 111222333.	Apply	1
10.	**Construct** a Transition Table for Turing Machine to implement Subtraction (m-n).	Apply	1
11.	Design Turing machine to increment the value of any binary number	Create	1

	by 1.The output should also be a binary number with value one more the number given.		

S. No.	Questions	Blooms Taxonomy Level	Course Outcomes
12.	**Construct** Transition diagram for TM - $L=\{a^nb^nc^n/n>=1\}$	Apply	2
13.	**Construct** a Transition diagram for Turing Machine to implement Subtraction (m-n).	Apply	2
14.	**Construct** a Transition table for Turing Machine to accept the language $L= \{ w\#w^R \mid w \epsilon (a + b)^* \}$	Apply	2
15.	**Construct** a Transition diagram for Turing Machine which shift non block symbols 3 cells to the right.	Apply	2
16.	**Construct** Transition table for Turing Machine that accepts the language $L = \{0^n1^n \mid n \geq 1\}$. Give the transition diagram for the Turing Machine obtained and also show the moves made by the Turing machine for the string 000111.	Apply	3
17.	**Construct** a Transition table for Turing Machine to accept the following language. $L = \{ 0^n1^n0^n \mid n \geq 1\}$	Apply	3
18.	**Construct** a Transition diagram for Turing Machine to accept the language $L= \{ ww^R \mid w \epsilon (a + b)^* \}$	Apply	4
19.	**Construct** Transition table for TM - $L=\{a^nb^nc^n/n>=1\}$	Apply	4
20.	**Construct** a Transition table for Turing Machine to accept the language $L= \{ ww^R \mid w \epsilon (a + b)^* \}$	Apply	4
	UNIT – V		
1.	**Explain** the concept of undecidability problems about Turing Machines.	Understand	3

<table>
<tr><td>2.</td><td>Write a note on Modified PCP and Multi tape Turing machine.</td><td>Apply</td><td>3</td></tr>
<tr><td>3.</td><td>Explain individually classes P and NP</td><td>Understand</td><td>2</td></tr>
<tr><td>4.</td><td>Write a shot notes on post's correspondence problem and check the following is PCP or not.
<table><tr><td>I</td><td>A</td><td>B</td></tr><tr><td>1</td><td>11</td><td>111</td></tr><tr><td>2</td><td>100</td><td>001</td></tr><tr><td>3</td><td>111</td><td>11</td></tr></table></td><td>Apply</td><td>2</td></tr>
<tr><td>5.</td><td>Explain the Halting problem and Turing Reducibility.</td><td>Understand</td><td>2</td></tr>
<tr><td>6.</td><td>Write a short notes on universal Turing machine.</td><td>Apply</td><td>3</td></tr>
<tr><td>7.</td><td>Write a short notes on Chomsky hierarchy.</td><td>Apply</td><td>2</td></tr>
<tr><td>8.</td><td>Write a short notes on Context sensitive language and linear bounded automata.</td><td>Apply</td><td>3</td></tr>
<tr><td>9.</td><td>Write a short note on NP complete</td><td>Apply</td><td>4</td></tr>
<tr><td>10.</td><td>Write a short note on NP hard problems.</td><td>Apply</td><td>4</td></tr>
<tr><td>11.</td><td>Write a shot notes on post's correspondence problem and check the following is PCP or not.
<table><tr><td>I</td><td>A</td><td>B</td></tr><tr><td>1</td><td>100</td><td>1</td></tr><tr><td>2</td><td>0</td><td>100</td></tr><tr><td>3</td><td>1</td><td>0</td></tr></table></td><td>Apply</td><td>4</td></tr>
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</table>

3. Group - III (Analytical Questions)

S. No.	Questions	Blooms Taxonomy Level	Course Outcomes
	PROBLEM SOLVING/ANALYTICAL/CRITICAL THINKINGQUESTIONS		
	UNIT - I		
1	**Construct** NFA for (0 + 1)*0(0 + 1)0(0 + 1)* and convert to DFA.	Apply	2
2	**Construct** NFA for (0 + 1)*010(0 + 1)* and Convert to DFA.	Apply	2
3	**Construct** NFA with Ɛ for 0*1*12* and Convert to NFA .	Apply	2
4	**Construct** Mealy Machine for Residue Modulo of 5 for the ternary number system and convert to Moore Machines.	Apply	2
5	**Write** the DFA that will accept those words from □ □ □ □ *a*{, *b*} where thenumber of a‟s is divisible by two and the number of *b*‟s is divisible by three. Sketchthe transition table of the finite Automaton *M* .	Apply	2
6	**Construct** DFA for the given NFA as shown in fig. below	Apply	2
	UNIT - II		
1	**Convert** Regular Expression (11 + 0)*(00 + 1)* to NFA with Ɛ.	Understand	1
2	**Convert** Regular Expression (a + b)*(aa + bb)(a + b)* to DFA.	Understand	1
3	**Construct** Regular Grammars for Finite Automata 0*(1(0 + 1))* .	Apply	1
4	**Construct** Finite Automata for A0 □ a A1 A1 □ b A1 A1 □ a A1 □ bA0	Apply	2

	UNIT - III		
1	**Construct** PDA for equal number of x‟s and y‟s	Appl y	3
2	**Convert** the following grammar into GNF A1 □A2 A3 A2 □ A3 A1 /b A3□ A1 A2 /a	Understand	4
3	**Convert** the following PDA to CFG δ(q0,0,z0)={q0,xz0) δ(q0,0,x)=(q0,xx) δ(q0,1,x)=(q1,ϵ) δ(q1,1,x) = (q1,ϵ) δ(q1,ϵ,x)=(q1,ϵ) δ(q1,ϵ,z0)=(q1,ϵ)	Undersandt	1
4	Write the PDA with only one state that accepts the language{$a^m b^n$:n>m}	Appl y	1
5	**Design** a PDA for the following grammar S->0A A->0AB/1 B->1	Create	1
6	**Convert** the following PDA to CFG M=({q0,q1},{a,b},{z0,za},μ,q0,z0,Φ) δ is given by, δ(q0,a,z0)=(q0,zz) δ(q0,a,z)=(q0,zz0) δ(q0,b,z)=(q1,ϵ) δ(q1,b,z)=(q1,ϵ) δ(q1,ϵ,z0)=(q1,ϵ)	Understand	2
	UNIT - IV		
1	**Construct** a Turing Machine that accepts the language	Apply	2

	L = $\{a^{2n}b^n \mid n \geq 0\}$. Give the transition diagram for the Turing Machine obtained.		
2	**Construct** a Turing Machine that gives two"s compliment for the given binary representation.	Apply	2
3	**Construct** a Turing Machine to accept the following language. L = $\{ w^n x^n y^n z^n \mid n \geq 1\}$	Apply	3
4	**Construct** a Turing Machine which shift non block symbols 2 cells to theright.	Apply	3
	UNIT - V		
1	**Explain** PCP and MPCP with examples.	Understand	4
2	**Explain** Turing theorem ,Halting problems, Turing Reducibility.	Understand	4
3	**Explain** Type 3 and Type 2 grammars with example.	Apply	4
4	**Explain** Type 1 and Type 0 grammars with example.	Apply	4

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

COMPUTER SCIENCE AND ENGINEERING

COURSE DESCRIPTION FORM

Course Title	**INFORMATION RETREVAL SYSTEM**			
Course Code	2050544			
Regulation	**R20 - JNTUH**			
Course Structure	Lectures	Tutorials	Practical" s	Credits
	3	-	-	3
Course Faculty	Dr. Arun Kumar			

I.COURSE OVERVIEW:

The main objective of this course is to present the scientific support in the field of information search and retrieval. This course explores the fundamental relationship between information retrieval, hypermedia architectures, and semantic models, thus deploying and testing several important retrieval models such as vector space, Boolean and query expansion. It discusses implementation and evaluation issues of new algorithms like clustering, pattern searching, and stemming with advanced data/file structures, indirectly facilitating a platform to implement comprehensive catalogue of information search tools while designing an e-commerce web site.

II.PREREQUISITE(S):

Level	Credits	Periods/ Week	Prerequisites
UG	3	4	Computer Programming

III.COURSE ASSESSMENT METHODS:

Session Marks	University End Exam marks	Total marks
Midterm Test There shall be two midterm examinations. Each midterm examination consists of essay paper. The essay paper is for 25 marks of 90 minutes duration and shall contain PART-A and PART-B. PART-A of 10 marks, It consists 10 questions student has to answer all questions each carries 1 Mark, PART-B of 15 marks, It contains 3 questions with internal choice, each question carries 5 marks.	70	100

I. EVALUATION SCHEME:

S. No	Component	Duration	Marks
1.	I Mid Examination	90 minutes	25
2.	I Assignment	-	5
3.	II Mid Examination	90 minutes	25
4.	II Assignment	-	5
5.	External Examination	3 hours	70

II. COURSE OBJECTIVES:

At the end of the course, the students will be able to:

I. Be familiar with genesis and diversity of information retrieval situations for text and hypermedia.
II. Provide hands-on experience store, and retrieve information from www using semanticapproaches
III. Be Familiar with various indexing and pattern search techniques of information retrieval.
IV. Master the usage of different data/file structures in building computational search engines.
V. Master and evaluate the performance of information retrieval using advanced techniques suchas classification, clustering, and filtering over multimedia.
VI. Be familiar with ranked retrieval of a very large number of documents with hyperlinks between
VII. Master Information visualization technologies like Cognition and perception in the Internet orWeb search engine.

III.COURSE OUTCOMES:

At the end of the course the student will develop ability to

CO	Course outcome	Blooms taxonomy level
C315.1	Apply IR principles to locate relevant information large collections of data	Apply
C315.2	Design different document clustering algorithms	Apply
C315.3	Implement retrieval systems for web search tasks and can Understandthe important concepts and algorithms in IRS	Analyse
C315.4	Understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems	Analyse
C315.5	Design an Information Retrieval System for web search tasks.	Evaluate

IV.HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	H	Assignments, Tutorials
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	H	Assignments
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	S	Mini Projects
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	S	Projects
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	S	Mini Projects
PO6	**The engineer and society**: Apply reasoning informed by the		

	contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	S	Assignments
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societaland environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	N	--
PO8	**Ethics**: Apply ethical principles and commit to professionalethics and responsibilities and norms of the engineering practice.	N	--
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	N	--
PO10	**Communication**: Communicate effectively on complexengineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	S	Assignments
PO11	**Project management and finance**: Demonstrate knowledgeand understanding the engineering and principles of management and apply these to one‟s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	N	--
PO12	**Life-long learning**: Recognize the need for, and have thepreparation and ability to engage in independent and life-long learning in the broadest context of technological change.	S	Projects

N - None **S - Supportive** **H - Highly Related**

VI. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	**Applications of Computing**: Ability to use knowledge in variousdomains to provide solution to new ideas and innovations.	H	Lectures, Assignments
PSO2	**Programming Skills**: Identify required data structures, design suitablealgorithms, develop and maintain software for real world problems.	H	Projects

N - None S - Supportive H - Highly Related

VII. SYLLABUS:

UNIT - I

Introduction: Retrieval Strategies : Vector Space Model , Probabilistic retrieval strategies : Simpleterm weights, Non binary independence model, Language models.

UNIT – II

Retrieval Utilities : Relevance feedback , Clustering , N-grams , Regression analysis , Thesauri.

UNIT – III

Retrieval Utilities : Semantic networks , Parsing.
Cross-Language Information Retrieval : Introduction, Crossing the Language barrier.

UNIT – IV

Efficiency : Inverted Index , Query Processing ,Signature files , Duplicate document detection.

UNIT – V

Integrated Structured Data and Text: A Historical progression , Information retrieval as a relationalapplication , Semi-structured search using a relational schema.
Distributed Information retrieval: A Theoretical model of distributed retrieval ,Web search.

Text Books:

David A. Grossman,Ophir Frieder,Information Retrieval- Algorithms and Heuristic,Springer , 2nd edition(Distributed by Universities Press),20004.

Reference Books:

1. Gerald J. Kowalski, Mark T. Maybury.Information Storage and Retrieval Systems Springer2000
2. Soumen Chakrabarti,Mining the Web:Discovering Knowledge from Hypertext Data,Morgan-Kaufmann Publishers,2002.
3. Christopher D. Manning, Prabhakar Raghavan, Hinrich. Schütze, Introduction to InformationRetrieval, Cambridge University Press, Cambridge,England,20009.

Reference/Suggested Papers:

Douglass R. Cutting, David R. Kargerd, Jan O. Pedersen, John W. Tukey: Scatter/Gather: acluster-based approach to browsing large document collections – 1992 Cited 423 times.

Jay M. Ponte, W. Bruce Croft: A language modeling approach to information retrieval - 1998Cited 721 times.

Thomas Hofmann: Probabilistic latent semantic indexing - 1999 Cited 768 times.

Jinxi Xu, W. Bruce Croft: Query expansion using local and global document analysis - 1996Cited 412 times.

Yiming Yang, Xin Liu: A re-examination of text categorization methods - 1999 Cited 643Times.

Kalervo jarvelin, Jaana Kekalanin: IR evaluation methods for retrieving highly relevantdocuments - 2000 Cited 379 times.

Jaime Carbonell, Jade Goldstein: The use of MMR, diversity-based reranking for reordering documents and producing Summaries - 1998 Cited 478 times.

Jonathan L. Herlocker, Joseph A. Konstan, Al Borchers, and John Riedl: An algorithmic framework for performing collaborative filtering - 1999 Cited 578 times.

Chengxiang Zhai, John Lafferty: A study of smoothing methods for language models appliedto Ad Hoc information Retrieval - 2001 Cited 451 time.

VIII. COURSE PLAN:

At the end of the course, the students are able to achieve the following course learningoutcomes:

Lecture No.	Topics to be covered	Course Learning Outcomes	Reference
1-2	Introduction to Information Retrieval Systems. Precision and Recall.	**Understand** the Functional overview of IRS	T1: 1
3-4	Retrieval Strategies:Vector space model.	**Illustrate** the model for aquery with different documents.	T1: 2.1
5-7	Probabilistic retrieval strategies:simpleterm weights.	**Applying** weights to terms.	T1: 2.2 – 2.2.1
8	Non binary independence model	**Illustrate** normalization ofdocument length.	T1: 2.2.2
9-11	Language models:Smoothing	**Understand** probability foreach term with smoothing**.**	T1: 2.3
12-14	Retrieval Utilities:Relevance feedback in the vector space model and probabilistic model	**Understand** relevancefeedback .	T1: 3.1
15-18	Clustering	**Understand different** clustering algorithms.	T1: 3.2
19-20	N grams	**Understand** the N gramdatastructure.	T1: 3.4
21	Regression Analysis	**Understand** the Probabilityof relevance.	T1: 3.5
22-25	Thesauri	**Understand** the Constructionof and generating thesauri.	T1: 3.6
26-27	Retrieval Utilities:Semantic networks	**Illustrate** about differentdistance measures	T1: 3.7
28-29	Parsing	**Understand** different parses	T1: 3.8
30	Cross-Language Information retrieval:Introduction	**Understand** the evaluation ofCross-Language Information retrieval	T1: 4.1
31-33	Crossing the language barrier	**Understand** query and	T1: 4.2

		document translation	
34-36	Efficiency:Inverted index	**Illustrate** the construction and compression of inverted index	T1: 5.1
37-38	Query processing	**Illustrate index modifications and simplifications**	T1: 5.2
39-40	Signature of files	**Describe** the scanning toremove false positives	T1: 5.3
41-42	Duplicate document detection	**Describe exact and similarduplicates**	T1: 5.4
43-44	Integratedstructured data and text:AHistorical progression	**Understand user definedoperators**	T1: 6.2
45-49	Information retrieval as a relationalapplication	**Illustrate** the proximitysearches	T1: 6.3
50-51	Semi structured search using a relationalschema	**Explain** the storage and tracking XML documents	T1: 6.4
52-53	Distributed Information Retrieval:A Theoritical model of distributed retrieval	**Understand** the distributedretrieval models	T1: 8.1
54-55	Web search	**Understand different websearches**	T1: 8.2

IX. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Program outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO 1**	**PSO 2**	**PSO 3**
C315.1	3	3	2	2	3	1	0	0	0	0	0	0	0	0	0
C315.2	3	3	2	2	3	1	0	0	0	0	0	0	0	0	0
C315.3	3	3	2	2	3	1	0	0	0	0	0	0	0	0	0
C315.4	3	3	2	2	3	1	0	0	0	0	0	0	0	0	0
C315.5	3	3	2	2	3	1	0	0	0	0	0	0	0	0	0
Average	**3**	**3**	**2**	**2**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

COMPUTER SCIENCE ANDENGINEERING

ASSIGNMENT

Course Name	**INFORMATION RETRIEVAL SYSTEM**
Course Code	2050544
Class	III B. Tech I Semester
Branch	Computer Science and Engineering
Year	2020 – 21
Course Faculty	Dr. Arun Kumar

OBJECTIVES:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner‟s learning process.

ASSIGNMENT – I & II

S. No	Questions	Blooms Taxonomy Level	Course Outcomes
	UNIT – I		
1	**Differentiate** DBMS with information retrieval system?	Understand	2
2	**Explain** IRS browse capabilities?	Understand	1
3	**List** 3 differences between data retrieval and information retrieval?	Remember	2
4	**Explain** Precision and Recall?	Understand	1
5	**Define** similarity coefficient in vector space model?	Apply	2
6	**Differentiate** relevant retrieved and non-relevant retrieved**?**	Apply	2
7	**Differentiate** browsing vs. Searching?	Understand	1
8	**Differentiate** digital libraries and data warehouses?	Understand	1
9	**List** 5 challenges of searching for information o the web?	Remember	1
10	**Explain** about the objectives of IRS?	Apply	2
	UNIT – II		

1	**Explain** N-gram data structure?	Remembe r	3
2	**Describe** regression analysis?	Apply	3
3	**Define** term co-ocurrence?	Remembe r	2
4	**Explain** the concept of information extraction?	Remembe r	2
5	**Explain** top-down and bottom-up procedure used in hierarchically clusteredcollections?	Understa nd	2
6	**List** six different sort orders to expand initial query in probabilistic model?	Remembe r	3
7	**Explain** relevance feedback?	Remembe r	2
8	**Discuss** about clustering algorithms?	Understa nd	2
9	**Discuss** efficiency uses in clustering?	Understa nd	3
10	**Define** regression analysis?	Understa nd	3
UNIT – III			
1	**Define** K-distance?	Apply	2
2	**Discuss** translation?	Apply	2
3	**Explain** clustering?	Understa nd	3
4	**Define** cross language information retrieval?	Remembe r	2
5	**Define** query translation?	Remembe r	3
6	**Define** phrase translation?	Apply	3
7	**Define** document translation	Remembe r	3
8	**Define** unbalanced approach of choosing translation?	Understa nd	3
9	**Discuss** about structured queries?	Remembe r	3
10	**Define** cross language information retrieval?	Remembe r	2
UNIT – IV			
1	**Define** is term clustering?	Remembe r	3
2	**Describe** are various types of automatic term clustering techniques?	Remembe r	1
3	**Describe** hypertext linkages?	Understa nd	2
4	**Describe** document clustering?	Understa nd	2
5	**Define** about hierarchy of clusters with example?	Remembe r	1
6	**Describe** the technique for term clustering?	Understa nd	2
7	**Describe** the process of thesaurus generation?	Understa nd	2
8	**Describe** Cliques?	Apply	1
9	**Define** single link?	Understa nd	1
10	**Differentiate** Cliques and single link?	Remembe r	1
UNIT – V			

1	**Describe** various information visualization technologies?	Remember	2
2	**Describe** in short about searching the internet?	Understand	2
3	**Define** relevance feed back?	Understand	2
4	**Define** Rocchio algorithm for relevance method?	Understand	1
5	**Describe** about relevance feedback techniques?	Understand	2
6	**Define** the features related to cognitions and perception?	Understand	2
7	**Describe** search statements and binding?	Understand	2
8	**Define** Similarity measures?	Understand	3
9	**Define** ranking?	Understand	3
10	**Describe** Similarity measures and ranking?	Understand	3

COMPUTER SCIENCE AND ENGINEERING

TUTORIAL QUESTION BANK

Course Name	**INFORMATION RETRIEVAL SYSTEM**
Course Code	**2050544**
Class	III B. Tech I Semester
Branch	Computer Science and Engineering
Year	2020-21
Course Faculty	Dr. Arun Kumar

OBJECTIVES:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

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PART - A (SHORT ANSWER QUESTIONS)

S No	Question	Blooms Taxonomy Level	Course Outcome
	UNIT – I		
	Part - A (Short Answer Questions)		
1	**Define** information retrieval system?	Knowledge	1
2	**Differentiate** DBMS with information retrieval system?	Understand	1
3	**Differentiate** browsing vs. Searching?	Knowledge	1
4	**Explain** your answer with relevant example Can information retrieval system be related to a database management system?	Knowledge	1
5	**Define b**riefly terms **1.** Precision **2.** Recall	Knowledge	1
6	**List** 5 challenges of searching for information o the web?	Knowledge	1
7	**List** 3difference between data retrieval and information retrieval?	Knowledge	1
8	**Differentiate** the terms relevant and retrieved?	Understand	1
9	**Advantages** of information retrieval system?	Understand	1
10	**Define** vector space model**?**	Knowledge	2
11	**Define** Retrieval Strategies?	Knowledge	2

12	**Define** Smoothing?	Understand	2
13	**Define** similarity coefficient to compute similarity between query and document?	Understand	2
14	**Explain** the following statement In order to evaluate the	Understand	1
	effectiveness of a web search engine for general users, Would it generally be more Important to measure precision or recall?		
15	**Differentiate** digital libraries and data warehouses?	Knowledge	1
	Part - B (Long Answer Questions)		
1	**Explain** the differences between Information Retrieval Systems and DBMS?	Apply	1
2	**Explain** similarity coefficient and determine the ranking offollowing documents Q:gold silver truck D1:shipment of gold damaged in a fire D2:delivery of silver arrived in a silver truckD3:shipment of gold arrived in a truck	Knowledge	2
3	**Explain** the concept of simple term weights for the above query and documents?	Understand	2
4	**Explain** inverse document frequency?	Evaluate	1
5	**Explain** about the objectives of IRS?	Understand	1
6	**Discuss** term frequencies? with an example?	Evaluate	2
7	**Explain**, How the information retrieval system is related to database Management system?	Understand	2
8	**Explain** about the objectives of IRS?	Understand	2
9	**Explain** the concept of non binary independence model for the above query and documents?	Understand	1
10	**Explain** the concept smoothing for the above query and Documents	Understand	2
11	**Discuss** Similarities between vector space model and probabilistic retrieval Strategy?	Understand	1
12	**Explain** the construction of vector document?	Knowledge	2
13	**Explain** similarity coefficient and determine the ranking offollowing documents in Probabilistic retrieval strategy? Q:gold silver truck D1:shipment of gold damaged in a fire D2:delivery of silver arrived in a silver truck D3:shipment of gold arrived in a truck	Evaluate	2

14	**Discuss** the term Frequencies for the followingQ:new new times D1:new York timesD2:new York posts D3:loss angels times	Evaluate	2
15	**Define** IDF and calculate the same for the above query and documents?	Knowledge	2
	Part - C (Problem Solving and Critical Thinking Questions)		
1	**Explain** the Estimation of Document Vectors for the following3 documents D1:New York TimesD2:New York Post D3: Los Angeles TimesQ:New New Times	Understand	2
2	**Explain** the use of invert index in vector space model?	Apply	1
3	**Define** Term weight?	Understand	1
4	**Explain** inverse document frequency?	Apply	2
5	**Discuss** about vector space model**?**	Understand	2
6	**Discuss** about Retrieval Strategies?	Apply	2
7	**Calculate** the precision and recall scores for the search A Database contain 9Records .A Search was Conducted on that Topic and 7 Records were retrieved .Of the 7 records retrieved,4 were relevant?	Apply	1
8	**Calculate** the precision and recall scores for the search A Database contain 80 Records .A Search was Conducted on that Topic and 60 Records were retrieved .Of the 60 records retrieved,45 were relevant?	Understand	1
9	**Explain** the Estimation of Non-Binary independent model forthe following 3 documents D1:New York TimesD2:New York Post D3: Los Angeles TimesQ:New New Times	Knowledge	2
10	**Explain** the Estimation of Smoothing in language model forthe following 3 documents D1:New York TimesD2:New York Post D3: Los Angeles TimesQ:New New Times	Apply	2

UNIT – II			
Part - A (Short Answer Questions)			
1	**Explain** the purpose of retrieval utilities?	Knowledge	3
2	**Explain** the concept of clustering as a retrieval utility?	Understand	3
3	**Explain** how Relevance feedback is used to improve the results of retrieval strategy?	Knowledge	1
4	**Explain** N-gram data structure?	Knowledge	2
5	**Describe** regression analysis?	Knowledge	2
6	**Define** term co-occurrence?	Knowledge	2
7	**Explain** six different sort orders to expand initial query in probabilistic model?	Knowledge	2
8	**Explain** three different bottom-up procedures used in hierarchically clustered collections?	Understand	3
9	**Explain** k-means algorithm?	Apply	3
10	**Discuss** efficiency uses in clustering?	Understand	3
11	**Discuss** the formula for the basic weight in the probabilistic retrieval strategy?	Knowledge	2
12	**Discuss** four variations for composing the new query?	Knowledge	2
13	**Discuss** three variations used in feedback iterations?	Knowledge	2
14	**Explain** how users are involved in relevance feedback?	Knowledge	2
15	**Define** simple link clustering?	Understand	3
Part - B (Long Answer Questions)			
1	**Explain** about relevance feedback in vector space model?	Understand	3
2	**Explain** about relevance feedback in probabilistic model?	Understand	3
3	**Discuss** the use of manually generated thesaurus?	Knowledge	2
4	**Explain** the concept of thesauri by constructing term-term similarity matrix?	Knowledge	3
5	**Explain** the approach of regression analysis to estimate the probability of relevance?	Knowledge	3
6	**Explain** how n-grams are used for detection and correction of spelling errors?	Knowledge	3
7	**Define** clustering and Explain hierarchical agglomerative clustering**?**	Understand	3
8	**Explain** the usage of document clustering to generate a thesaurus?	Knowledge	2
9	**Explain** clustering with single value decomposition?	Knowledg	3

		e	
10	**Explain** term context used in thesaurus?	Knowledg e	2
11	**Discuss** clustering without a recomputed matrix?	Knowledg e	3
12	**Describe** extended relevance ranking with manual thesaurus?	Knowledg e	2
13	**Explain** Rocchio and Buckshot clustering algorithm?	Apply	3
14	**Explain** Damshek work for implementing five gram based measure of relevance?	Knowledg e	2
15	**Explain** six different sort orders to expand initial query with the number of iterations to perform successful relevance feedback?	Understan d	3
	Part - C (Problem Solving and Critical Thinking Questions)		
1	**Explain** the use of probabilistic model in relevance feedback?	Knowledg e	3
2	**Differentiate** single link clustering, complete linkage and group average?	Apply	3
3	**Explain** clustering without pre computed matrix?	Understan d	3
4	**Explain** n-gram developed by D Amore and Mah?	Understan d	2
5	**Explain** term co-occurrences in automatically constructed thesauri?	Understan d	2
6	**Explain** relevance feedback process with diagram?	Knowledg e	3
7	**Explain** vector space relevance feedback process?	Apply	3
8	**Discuss** about partial query expansion?	Understan d	2
9	**Discuss** about hierarchically clustered collections?	Understan d	3
10	**Discuss** efficiency uses?	Understan d	3
	UNIT – III		
	Part - A (Short Answer Questions)		
1	**Discuss** R-distance for calculating distance between query and document?	Understan d	2
2	**Describe** how ranking is based on constrained spreading activation?	Knowledg e	2
3	**Explain** how NLP is used to reduce ambiguity in language?	Knowledg e	2
4	**Define** cross language information retrieval?	Apply	2
5	**Define** query translation?	Understan d	2
6	**Define** phrase translation?	Understan d	2
7	**Explain** the concept of pruning translation**?**	Understan d	2
8	**Define** document translation?	Knowledg e	3
9	**Explain** the approach of balancing queries?	Knowledg	3

		e	
10	**Discuss** about k-distance?	Knowledg e	3
11	**Describe** evaluation of distance measures?	Knowledg e	2
12	**Discuss** about performance of cross language information retrieval system?	Apply	1
13	**Define** parsing?	Understan d	2
14	**Discuss** seven groups of relations into which a thesaurus is combined?	Understan d	3
15	**Explain** the use of pivot language in translation?	Knowledg e	1
Part - B (Long Answer Questions)			
1	**Explain** the concept of semantic networks for automatic relevance ranking?	Create	2
2	**Explain** why parsing is an essential feature of information retrieval system?	Understan d	2
3	**Explain** three different types of translations?	Apply	2
4	**Discuss** unbalanced and structured queries approaches for choosing translations?	Understan d	1
5	**Explain** about syntactic parsing?	Understan d	3
6	**Differentiate** R-distance and K-distance?	Knowledg e	2
7	**Discuss** balanced and pivot language approaches for choosing translations?	Knowledg e	1
8	**Explain** what resources used to implement Cross language retrieval system?	Apply	3
9	**Explain** the measure to evaluate the performance of Cross language information retrieval system?	Understan d	3
10	**Discuss** four questions to be answered to Cross language barrier?	Understan d	3
11	**Explain** about four different approaches in choosing translations?	Knowledg e	1
12	**Explain** how bilingual term list is used to improve accuracy?	Knowledg e	1
13	**Explain** the use of POS word sense tagging?	Knowledg e	2
14	**Explain** how message understanding conference focuses oninformation extraction?	Knowledg e	2
15	**Explain** the concept of distance measures in a semantic network?	Knowledg e	2
Part - C (Problem Solving and Critical Thinking Questions)			
1	**Differentiate** R-distance and K-distance?	Apply	2
2	**Explain** simple phrases and complex phrases?	Understan	2

		d	
3	**Explain** balanced query and structured query?	Understand	2
4	**Discuss** about unbalanced queries?	Apply	2
5	**Discuss** about quality of bilingual term lists?	Understand	3
6	**Describe** the method used to translate a query?	Understand	2
7	**Explain** the measures used to evaluate the performance of cross-language information retrieval systems?	Apply	2
8	**Explain** the resources used to implement cross-language information retrieval systems?	Understand	3
9	**Discuss** ranking based on constrained spreading activation?	Understand	3
10	**Describe** developing query term based on concepts?	Apply	3
UNIT - IV			
Part - A (Short Answer Questions)			
1	**Explain** index pruning?	Knowledge	2
2	**Explain** posting list?	Understand	2
3	**Define** document file?	Understand	2
4	**Describe** index?	Understand	3
5	**Explain** about I-Match?	Understand	3
6	**Describe** the method to find exact duplicates?	Understand	3
7	**Describe** scanning to remove false positives?	Understand	2
8	**List** two advantages of index file?	Knowledge	2
9	**Classify** different types of files?	Knowledge	2
10	**Define** weight file?	Understand	2
11	**Explain** about two top-down algorithms?	Understand	2
12	**Explain** index compression algorithms?	Knowledge	2
13	**Define** Fixed length Index Compression?	Knowledge	2
14	**Define** variable length index compression?	Understand	2
15	**Explain** about cutoff based on document frequency?	Understand	2
Part - B (Long Answer Questions)			
1	**Explain** methods to reorder documents prior to indexing?	Understand	3
2	**Discuss** methods to compress an inverted index?	Knowledge	3
3	**Define** efficiency? Explain about inverted index?	Knowledge	3
4	**Explain** about throughput-optimized compression?	Create	2
5	**Explain** various top-down and bottom-up algorithms?	Create	2

6	**Explain** how inverted index allows quick search of a postinglist?	Understand	3
7	**Explain** about duplicate document detection?	Evaluate	3
8	**Describe** method to build an inverted index?	Understand	2
9	**Describe** the method for finding similar duplicates?	Understand	2
10	**Explain** how signature files are used to detect duplicates?	Understand	2
11	**Describe** three methods to characterize posting list?	Create	3
12	**Discuss** about query processing?	Understand	2
13	**Discuss** about partial result set retrieval?	Evaluate	2
14	**Explain** about I-match used in duplicate document detection?	Understand	2
15	**Explain** vector space simplifications?	Understand	13
Part - C (Problem Solving and Critical Thinking Questions)			
1	**Explain** about Digital Libraries and Data Warehouses?	Understand	2
2	**Differentiate** "Digital Library" and an Information RetrievalSystem? What new areas of information retrieval research may be important to support a Digital Library?	Understand	2
3	**Explain** about Browse Capabilities?	Understand	2
4	**Define** Indexing? Explain the objectives of indexing and also discuss about Automatic indexing?	Understand	3
5	**Define** two major data structures in any information system?	Understand	3
	Describe the similarities and differences between term stemming algorithms and n-grams?	Knowledge	3
	Explain in detail about Vector Weighting. What are the general problems with the Vector Model?	Knowledge	2
	Explain about Natural Language Processing. Describe how use of Natural Language Processing will assist in thedisambiguation process?	Knowledge	3
	Explain Similarity Measures and Ranking?	Understand	2
	Discuss two major approaches to generating queries? Explain in detail?	Apply	2

UNIT - V			
Part - A (Short Answer Questions)			
1	**Define** Data Integrity?	Knowledge	2
2	**Define** performance?	Understand	1
3	**Define** Portability?	Understand	2
4	**Explain** are the extensions to SQL?	Understand	2
5	**List** different types of User-defined Operators?	Understand	2
6	**Explain** NFN Approaches?	Understand	3
7	**Define** proximity searches works?	Understand	3
8	**Explain** the operators used in Boolean query?	Understand	3
9	**Define** Boolean Retrieval?	Understand	2
10	**Define** Relational Information Retrieval system?	Understand	3
11	**Discuss** about Relational Schema?	Understand	2
12	**Explain** storing XML Metadata?	Knowledge	3
13	**Discuss** about XML-QL?	Knowledge	3
14	**What** is an Index?	Understand	3
15	**Define** attributes in Index?	Understand	3
Part - B (Long Answer Questions)			
1	**Explain** about historical progression?	Create	2
2	**Discuss** briefly about user-defined operators?	Understand	2
3	**Explain** Non-first normal form approaches?	Understand	2
4	**Discuss** about information retrieval as a relational application?	Understand	2
5	**Explain** about Boolean queries?	Apply	2
6	**Discuss** about proximity searches?	Understand	2
7	**Explain** the computation of relevance using unchanged SQL?	Create	3
8	**Describe** semi-structured search using a relational schema?	Create	3
9	**Explain** how static relational schema support XML-QL?	Apply	3
10	**Discuss** about relational information retrieval system?	Understand	3
11	**Explain** the method of tracking XML documents?	Understand	3
12	**Explain** how index table models an XML index?	Understand	3
13	**Explain** about a theoretical model of distributed retrieval?	Create	3
14	**Describe** centralized information retrieval system model?	Create	3
15	**Describe** distributed information retrieval system model?	Apply	1
Part - C (Problem Solving and Critical Thinking Questions)			
1	**Discuss** evaluation of web search engines?	Knowledge	2
2	**Explain** how run time performance is a disadvantage of information retrieval?	Knowledge	2
3	**Explain** how information retrieval becomes relational application?	Knowledge	3
4	**Explain** about relevance ranking?	Understand	3
5	Discuss how XML has become the standard for platform – independent data exchange?	Understand	3
6	**Explain** how data integrity and portability are disadvantages of information retrieval?	Understand	3
7	**Explain** how semi structured search is performed using relational schema?	Knowledge	3
8	**Explain** two methods of distributed retrieval?	Knowledge	3
9	**Discuss** briefly about web search?	Knowledge	3