Course Code: 1950320 | MLRS- R19

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

III B.Tech I Sem Supply End Examination, July 2022

Design of Machine Members – I

(MECH)

Time: 3 Hours. **Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.
2. In Part – A, answer all questions which carries 20 marks.
3. In Part – B, answer any one question from each unit.
Each question carries 10 marks and may have a, b as sub questions.

PART- A

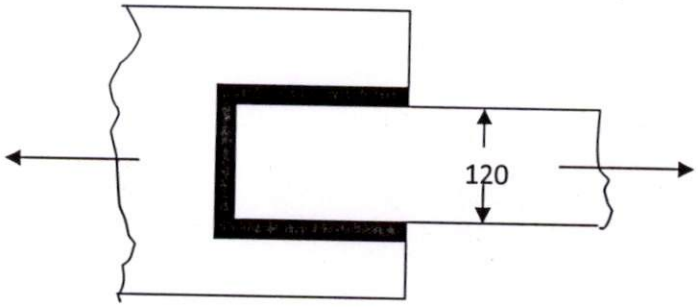
(10*2 Marks = 20 Marks)

1.	a)	What are the three basic modes of failure of mechanical components?	2M	CO1
	b)	In what respect does bending stress differ from direct tensile or compressive stress?	2M	CO1
	c)	What is Theoretical Stress concentration	2M	CO2
	d)	What is meant by notch sensitivity?	2M	CO2
	e)	Write the various ways in which a riveted joint may fail	2M	CO3
	f)	What are the practical applications of uniform strength of bolts?	2M	CO3
	g)	What is the function of key in shaft and hub assembly?	2M	CO4
	h)	Differentiate the sunk and saddle keys	2M	CO4
	i)	Differentiate between the Shaft and axle.	2M	CO5
	j)	What is the difference between coupling and clutch?	2M	CO5

PART- B

(10*5 Marks = 50 Marks)

2	a)	What is Factor of Safety ? Explain its role in mechanical Design	5M	CO1
	b)	A steel bar of square cross section with side of 20 mm is subjected to a load of 50 kN along the axis, causing tension. What is the magnitude of induced stress? What will be the magnitude of stress if the load increases to 250 kN. Ultimate strength of steel is 500 MPa	5M	CO1
		OR		
3		The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5 kN. Find the diameter of bolt required according to 1. Maximum principal stress theory; 2. Maximum shear stress theory; 3. Maximum principal strain theory; 4. Maximum strain energy theory; and 5. Maximum distortion energy theory.	10M	CO1

4	A 25 mm diameter shaft is made of forged steel 30C8 with ultimate strength of 600 MPa. There is a step in the shaft and the theoretical stress concentration factor at the step is 2.1. The notch sensitivity factor is 0.84. Determine the endurance limit of the shaft if it is subjected to a reversed bending moment .	10M	CO2
	OR		
5	A machined component is subjected to fluctuating stress that varies from 40 to 100 N/mm^2. The corrected endurance limit stress for the machine comment is 270N/mm^2. The ultimate tensile strength and yield strength of material are 600 and 450N/mm^2 respectively. Find the factor of safety using (i) Gerber theory (ii) Soderberg line (iii) Goodman line and also find the Factor of safety against static failure	10M	CO2
6	A double riveted double cover butt joint in plates 20-mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are 120 MPa in tension, 100 MPa in shear and 150 MPa in crushing. Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that of single shear	10M	CO3
	OR		
7	A plate 120 mm wide and 15 mm thick is joined with another plate by a single transverse weld and a double parallel fillet weld as shown in Fig. The maximum tensile and shear stresses are 70 MPa and 56 MPa respectively. Find the length of each parallel fillet weld, if the joint is subjected to both static and fatigue loading. Assume a length of 12.5 mm for starting and stopping of weld run. Take stress concentration factor for transverse weld as 1.5 and for parallel fillet welds as 2.5. 	10M	CO3
8	Design a sleeve and cotter joint to transmit 150kN.The working stresses are 60 N/mm^2 in tension, 50 N/mm^2 in shear and 120 N/mm^2 in compression .The sleeve , rod and cotter are made of same material.	10M	CO4
	OR		
9	Design a gib and cotter joint to resist safely a tensile load of 40kN.The material of the gib, cotter and rods is same for which the allowable safe stresses are: σ_c=60.0N/mm^2, σ_t=25.0N/mm^{2}and τ_s =20.0N/mm^2.	10M	CO4

10	A shaft, 2m long between bearings, carries a 900N pulley at its mid-point. Through a belt drive, the shaft receives 25kW at 180 r.p.m. The belt drive is horizontal, and the sum of the belt tensions is 7kN. Determine the shaft diameter and angle of twist, the shaft undergoes .Take G= 80GN/m^2.	10M	CO5

OR

11	In a flange shaft coupling having 40 mm bore, it is desired that torsional stress in the shaft will not exceed 25 MPa. The outside diameter of the coupling limited by space is 200 mm. There are three 15 mm bolts on a bolt circle diameter of 140 mm. The radial flange thickness is 18mm. Determine the following: a) The power that may be transmitted at 600 rev/min. b) The shearing stress in the bolts. c) The bearing pressure on the bolts	10M	CO5

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