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

MLRS

IV B.Tech I Sem Regular End Examination, Nov/Dec 2022
Microwave and Optical Communications
(ECE)

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)	State the high frequency limitations of conventional tubes.	2M	CO1	BL1
	b)	Draw different types of slow wave structures.	2M	CO1	BL1
	c)	Why PI- mode of operation is preferred in Magnetron.	2M	CO2	BL1
	d)	Define Gunn effect?	2M	CO2	BL1
	e)	A coupler is having 5 dB coupling factor and 20 dB directivity. If the coupler is having incident power 1Watt. How much power is coupled into coupled port.	2M	CO3	BL3
	f)	Draw the E-plane Tee junction diagram	2M	CO3	BL1
	g)	In a VSWR meter the VSWR measured is 3.0. What percentage of power is reflected.	2M	CO4	BL3
	h)	Name different components in typical microwave bench	2M	CO4	BL1
	i)	Define Total Internal Reflection in optical fiber.	2M	CO5	BL1
	j)	What are the various types of optical fibers?	2M	CO5	BL1

PART- B
(10*5 Marks = 50 Marks)

2	a)	Draw the mode characteristics of reflex klystron and explain the operation.	5M	CO1	BL1
	b)	A two cavity klystron operates at 4.5 GHz. The Dc beam load voltage is 8KV. Cavity gap spacing is 2 mm for a given input, the magnitude of gap voltage is 100V.Calculate the time of the electrons in the gap, gap transit angle and range of velocity of electrons as they leave the gap region.	5M	CO1	BL3

OR

3	a)	Derive an expression for the velocity modulation in Klystron amplifier..	5M	CO1	BL6
	b)	Draw TWT diagram and explain amplification process	5M	CO1	BL4

4	a)	Draw the schematic diagram of a magnetron and derive equation for cutoff voltage.	5M	CO2	BL6
	b)	Explain the construction and operation of 8 cavity magnetron.	5M	CO2	BL4

<div align="center">OR</div>

5	a)	Explain the operation of GUNN diode along with its V-I characteristics	5M	CO2	BL4
	b)	An n-type GaAs Gunn diode has the following specifications.	5M	CO2	BL3

Threshold field 4 KV/cm
Applied field 3.5 KV/cm
Device length 10 micrometers
Doping constant 10^{14} electrons/cm^3
Operating frequency 10 GHZ
Calculate the current density and electron mobility in the device.

6	a)	Describe the working of Bethe-hole directional coupler.	5M	CO3	BL2
	b)	A directional coupler is having coupling factor =10 dB and directivity = 40dB. Determine the power coupled if the incident power is 1 watt	5M	CO3	BL3

<div align="center">OR</div>

7	a)	Explain the working of Magic Tee with neat sketch and discuss any one application	5M	CO3	BL4
	b)	Define resonant frequency, Q factor of a cavity and draw diagram of rectangular cavity.	5M	CO3	BL1

8	a)	Explain the importance of S-parameters and list the properties	5M	CO4	BL4
	b)	The S-parameters of a two port network are given by	5M	CO4	BL3

$S_{11} = 0.4 \ \llcorner 0$ $S_{22} = 0.4 \ \llcorner 0$

$S_{12} = 0.5 \ \llcorner 180$ $S_{21} = 0.6 \ \llcorner 180$

Determine whether this network is reciprocal or symmetrical.

<div align="center">OR</div>

9	a)	Compare the power ratio and RF substitution methods of measuring attenuation provided by microwave component?	5M	CO4	BL2
	b)	Explain the low VSWR measurements with the help of block diagram.	5M	CO4	BL4

10	a)	What are the losses occurred in optical fibers? Explain briefly.	5M	CO5	BL4
	b)	How to reduce the signal attenuation in optical fibers.	5M	CO5	BL1

<div align="center">OR</div>

11	a)	Discuss the characteristics of laser transmitter with suitable circuits	5M	CO5	BL2
	b)	Explain the operation of WDM in optical communication.	5M	CO5	BL4

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CO-Course Outcome   **BL - Blooms Taxonomy Levels**