K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2024-25
B. Tech. Program: **Electronics and Telecommunication Engg.** Scheme: **II**
Carry On Regular Examination: LY Semester **VII**
Course Code: **EXC701** and Course Name: **Microwave Engineering**
Date of Exam: 23/06/25 Duration: 2.5 Hours Max. Marks: 60

Instructions:
(1). All questions are compulsory.
(2). Draw neat diagrams wherever applicable.
(3). Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	**Solve any two questions out of three: (05 marks each)**	10		
a)	List the name and range of Radar frequency bands according to IEEE standards. Summarize the advantages of microwaves over low frequency.		1	2
b)	Compare Transferred Electron Devices (TED) and Avalanche Transit Time Devices (ATTD)		3	2
c)	Explain microwave radar system.		6	2
Q 2	**Solve any two questions out of three: (05 marks each)**	10		
a)	An air filled rectangular waveguide has following parameters, a=4 cm, b= 2 cm. Solve for the cut-off frequency of TE_{10} & TM_{11} modes and show the dominant mode.		2	3
b)	Explain the term frequency pulling and frequency pushing in case of magnetron? Why phase focusing is required in magnetron? What is back heating? How it can be controlled?		4	2
c)	Summarize the microwave frequency measurement setup using microwave bench.		5	2
Q.3	**Solve any two questions out of three. (10 marks each)**	20		
a)	Select the shortest distance from the load and the length of the stub connected in parallel to a 50 Ω lossless line to match Z_L= (200+j100) Ω using single short circuited stub. (use smith chart)		2	3
b)	i. Describe the Ridley-Watkins-Hilsum theory and list the modes of the Gunn diodes. (3M) ii. Illustrate the structure and working of TRApped Plasma Avalanche Triggered Transit (TRAPATT) diode. (3M)		3	3

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	iii. What is Faraday rotation in Ferrite? Explain working of the isolator using Faraday rotation. Construct the s-matrix of isolator. (4 M)			
c)	List the methods to measure microwave power. Explain power measurement using Bolometer using suitable diagrams.		5	1
Q.4	**Solve any two questions out of three. (10 marks each)**	20		
a)	i. Explain the working principal of reflex Klystron with the help of Apple Gate diagrams. (5 M) ii. A reflex Klystron operates under the following conditions: (5 M) $V_0 = 600$ V, L=1 mm, $R_{th} = 15$ kΩ, e/m= 1.759×10^{11}, $f_r = 9$ GHz, $X'_{11} = 1.841$ $J_1(X') = 0.582$. The tube is oscillating at *fr* at the peak of the n=2 mode. Assume that the transit time through the gap and beam leading can be neglected. a) Find the value of the repeller voltage V_r. b) Find the direct current necessary to give a microwave gap voltage of 200 V.		4	3
b)	Derive the wave equation for a TE wave and obtain all field components in a rectangular waveguide.		3	3
c)	i. Comapre the CW and Pulsed radar. (3 M) ii. Define: Radar cross section, Radar range and Maximum unambiguous range. (3 M) iii. List the medical application of Microwaves and explain any one. (4 M)		5	2

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