

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

~~Dec 2024~~ **Jan / Feb 2025**

B. Tech. Program: **Electronics and Telecommunication Engg.** Scheme: II
~~Regular Examination: LY Semester VII~~
Supplementary Course Code: **EXC701** and Course Name: **Microwave Engineering**
 Date of Exam: **03-02-25** 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)	Compare the stripline, microstrip line and coplanar line type transmission lines.		1	2
b)	Explain parametric amplifier.		3	2
c)	Draw and explain the block diagram of a Basic Radar system.		6	2
Q 2	Solve any two questions out of three: (05 marks each)	10		
a)	Solve for the cut-off frequency of a Teflon-filled ($\epsilon_r = 2.1$) circular waveguide for dominant mode having an inner radius of 1 cm and it is excited at 10 GHz.		2	3
b)	Compare M-type and O-type microwave tubes.		4	2
c)	Explain the impedance measurement of unknown load using microwave bench.		5	2
Q.3	Solve any two questions out of three. (10 marks each)	20		
a)	Solve a matching network using single shunt open stub as tuning element to match a load impedance $Z_L = 20 + j15 \Omega$ to a 50Ω transmission line. (use smith chart)		2	3
b)	i. Explain tunneling phenomenon in tunnel diode. (3 M) ii. List the applications of GUNN diode. (3 M) iii. Construct the S-matrix of 4-port two-hole Directional coupler. (4 M)		3	3
c)	Explain the various methods of the measurement of antenna gain.		5	2
Q.4	Solve any two questions out of three. (10 marks each)	20		

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a)	i. What is TWT? Why it is called as a broadband amplifier? What do you mean by Slow Wave Structure (SWS)? What are different types of SWS? Explain its construction and amplification process. (5 M) ii. A helix TWT operates at 4 GHz under a beam voltage of 10 KV and the beam current of 500 mA. If the helix impedance is 25 ohms and the interaction length is 20 cm, find the output power gain in dB. (5 M)		4	3
b)	Derive the wave equation for a TE wave and obtain all the field components in a circular waveguide.		3	3
c)	i. Explain Doppler radar. (3 M) ii. List the industrial application of Microwaves and explain any one in brief. (3 M) iii. Summarize the RADAR range equation. (4 M)		5	2
