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

Jan – Feb 2026
~~November - December 2025-26~~

B. Tech. Program: **Electronics and Telecommunication Engg.** Scheme: **III**

~~Supplementary~~ Examination: LY Semester **VII**

Course Code: **EXC701** and Course Name: **Microwave Engineering**

Date of Exam: ~~29 Nov. 2025~~ 03|02|26   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)	Explain the working of Pulse Doppler radar and classify radar systems based on modulation techniques.		CO6	U
b)	Construct the S-matrices of magic-Tee and hybrid-Tee junctions.		CO2, CO3	Ap
c)	Differentiate a Gunn diode oscillator from conventional microwave vacuum tube oscillators.		CO3	U
Q 2	**Solve any two questions out of three: (05 marks each)**	10		
a)	Differentiate between TWT amplifier and klystron amplifier and explain the working of Helix TWT amplifier.		CO4	U
b)	Construct a microstrip line on a 0.5 mm alumina substrate ($\varepsilon r=9.9$, $\tan\delta=0.001$) for a 50 Ω characteristic impedance. Select the length of this line required to produce a phase delay of 270° at 10 GHz.		CO1	Ap
c)	Summarize the procedure for measuring unknown impedance using a microwave bench and slotted line set-up.		CO5	U
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 100 Ω lossless line to match $Z_L= 50+j25$ Ω using single open circuited stub. (use smith chart)		CO2	Ap
b)	Explain operation of Gunn diode using two valley model and explain different modes of Gunn diode.		CO3	U
c)	Explain any two absolute and any two relative methods used for measuring antenna gain.		CO5	U

	November - December 2025-26 B. Tech. Program: **Electronics and Telecommunication Engg.** Scheme: **III** **Examination**: LY Semester **VII** Course Code: **EXC701** and Course Name: **Microwave Engineering**		
Date of Exam: **29 Nov. 2025**	Duration: 2.5 Hours	Max. Marks: 60	

Q.4	**Solve any two questions out of three. (10 marks each)**	20		
a)	i. Appraise the wave equation for TM waves in a rectangular waveguide ii. An air filled rectangular waveguide has following parameters, a=4 cm, b= 1.5 cm. Solve for the cut-off frequency of TE_{10} & TM_{11} modes and show the dominant mode.		CO2	E
b)	A reflex Klystron operates under the following conditions: V_0 = 1000 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. 1. Find the value of the repeller voltage V_r. 2. Find the direct current necessary to give a microwave gap voltage of 200 V.		CO4	E
c)	Explain the concept of minimum detectable signal (MDS) in radar systems. Summarize its role in determining the effective radar range equation.		CO6	U

****