

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM**  
**(AUTONOMOUS)**  
**III B.Tech II Semester Regular/Supplementary Examinations, April - 2024**

**MICROWAVE ENGINEERING**  
**(ECE)**

Time: 3 hours

Max. Marks: 70 M

**Answer ONE Question from each Unit**  
**All Questions Carry Equal Marks**

Q. No.	Questions	BTL	CO	Marks
<b>UNIT – I</b>				
1.	a) Why TEM modes are not possible in hollow rectangular waveguides?	K2	CO1	7M
	b) A TE <sub>10</sub> wave at 10 GHz propagates in a rectangular wave guide of 1.5 cm × 0.6 cm dimensions filled with medium air. Determine guided wave length and wave impedance.	K3	CO1	7M
<b>OR</b>				
2.	a) Discuss the significance and advantage of dominant mode in rectangular wave guide.	K2	CO1	7M
	b) A rectangular waveguide with a width of 4 cm and a height of 2 cm is used to propagate an electromagnetic wave in the TE <sub>10</sub> mode. Determine the wave impedance, phase velocity, and group velocity of the waveguide for the wavelength of 6cm.	K3	CO1	7M
<b>UNIT – II</b>				
3.	a) What are the different types of Phase shifters? Explain any one with neat diagrams	K2	CO2	7M
	b) Draw the junction diagram of H-plane Tee and explain its characteristics.	K2	CO2	7M
<b>OR</b>				
4.	a) Write short notes on: (a) Waveguide Irises. (b) Matched loads (c) Dielectric phase shifters.	K2	CO2	7M
	b) Explain aperture type coupling mechanism with neat diagram	K3	CO2	7 M
<b>UNIT – III</b>				
5.	a) List out the limitations of conventional tubes at microwave frequencies and how to overcome with microwave tubes?	K2	CO3	7M
	b) Draw the structure and explain the velocity modulation process in two cavity klystron amplifier	K2	CO3	7M
<b>OR</b>				

6.		Explain the bunching process of two cavity klystron amplifier with Applegate diagram and also derive the equations for power efficiency.	K3	CO3	14M
<b>UNIT – IV</b>					
7.	a)	Elaborate the differences between electronic and mechanical tuning	K2	CO4	7M
	b)	Briefly explain the operation of TRAPATT diode?	K2	CO4	7M
<b>OR</b>					
8.	a)	Explain the following Gunn diode oscillation mode: (i) LSA mode.	K2	CO4	7M
	b)	In a Gunn diode with active length of $20\mu\text{m}$ , the drift velocity of electrons is $2 \times 10^7 \text{ cm/s}$ . Calculate the rational frequency and critical voltage of the diode.	K3	CO4	7M
<b>UNIT – V</b>					
9.	a)	Using slotted line, draw a typical microwave bench setup for measurement of unknown load and explain.	K2	CO5	7M
	b)	Two identical 30dB directional couplers are used to sample incident and reflected power in a wave guide. VSWR = 2 and the output of the coupler sampling incident power = 4.5 mW. What is the value of reflected power?	K3	CO5	7M
<b>OR</b>					
10.	a)	Give the measurement procedure for Q factor of a resonant cavity and attenuation constant at microwave frequencies.	K3	CO5	7M
	b)	Write short notes on (a) PML (b) Impedance symmetry	K3	CO5	7M