



R20 Regulation

Subject code:3P7DA

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

## B.Tech VII Semester Regular/Supplementary Examinations, December 2024

### MICROWAVE ENGINEERING (ECE)

Maximum Marks: 70

Date:10.01.2025

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
  2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
  3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
  4. Each question carries 10 marks and may have a, b, c, d as sub questions.

#### Part-A

All the following questions carry equal marks		(10X2M=20 Marks)	CO	Bloom Tx
1	Name different electromagnetic frequency spectrum region and microwave band designations for IEEE bands		1	1
2	List the applications of microwaves.		1	1
3	How to use tuning screws and posts in microwaves?		2	1
4	What are ferrites and give their properties?		2	1
5	Draw the Applegate diagram for a Reflex klystron operating in 1 ¼ mode.		3	2
6	What is transit time? How it is made use of in realization of microwave tubes		3	1
7	Draw V-I characteristics of GUNN diode.		4	1
8	How pi-mode is separated in Magnetron?		4	1
9	Explain the significance of scattering matrix		5	2
10	Why isolator is used in microwave bench set up?		5	1

#### Part-B

Answer All the following questions.		(5X10M=50Marks)	CO	Bloom Tx
11	A) What are TEM, TE, TM modes? Sketch the field patterns for dominant modes in a rectangular wave guide. [5M] B) Explain the impossibility of TEM mode in rectangular wave guide. [5M]		1	1
OR				
12	A rectangular wave guide is filled by dielectric material of $\epsilon_r = 9$ and has dimensions of $7 \times 3.5$ cm. It operates in the dominant $TE_{10}$ mode. i. Determine the cut off frequency. ii. Find the phase velocity in the guide at a frequency of 2 GHz. [10M]		1	3
13	A) A 20mV signal is fed to the series arm of a lossless Magic Tee junction. Calculate the power delivered through each port when other ports are terminated with a matched load. [5M] B) Explain coupling probes and coupling loops [5M]		2	3

	OR		
14	Explain the working of a directional coupler with a neat diagram and derive the expression for the coupling and directivity of a directional coupler [10M]	2	2
15	Explain in detail bunching process and obtain expression for bunching parameter in a two cavity klystron [10M]	3	2
	OR		
16	Draw different slow wave structures and with the help of neat diagram explain about Helix Travelling wave Tube [10M]	3	2
17	Explain how 8-cavity cylindrical Magnetron is used to produce oscillations. [10M]	4	2
	OR		
18	A) Explain Gunn Effect using two-valley theory? Also explain several modes of operation and applications of Gunn diodes [5M] B) Give the classification of solid-state microwave devices [5M]	4	3
19	Draw the structure of Magic tee and write its characteristics and also derive its S-matrix. [10M]	5	2
	OR		
20	A) What are the various methods of power measurement? Discuss about Bolometer method. [5M] B) Draw the block diagram setup to measure attenuation. Write the steps involved in measuring attenuation using RF substitution method. [5M]	5	1