R22 Regulation *Subject code: 4E7DA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VII Semester Regular/Supplementary Examinations, October 2026

MICROWAVE ENGINEERING

(ECE)

Maximum Marks: 60 Date:26.10.2026 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
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 (10X1M=10 Marks)		Marks	CO	BTL
1.a)	Write the equation of cutoff frequency of TM mode	1M	1	1
b)	List out any two advantages of Microwaves	1M	1	1
c)	What is Matched Load.	1M	2	1
d)	What is the function of an Isolator.	1M	2	1
e)	What is the difference between Travelling Wave Tube and 2-cavity Klystron	1M	3	2
f)	Distinguish between 2-Cavity Klystron Amplifier and Reflex Klystron Oscillator.	1M	3	2
g)	How pi mode is separated in Magnetron?	1M	4	1
h)	Define Phase Velocity and Group Velocity.	1M	4	1
i)	Why S Parameters are required in Microwave Frequencies?	1M	5	1
j)	Define Thermistor.	1M	5	1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	a) Derive all the expressions for the TM modes in a rectangular waveguide. b) Show that the cut-off frequency of a rectangular guide carrying the dominant TE_{10} is similar to TM_{10} mode.	6M 4M	1	2
	OR			
3	a) Why TEM wave propagation is not possible in rectangular wave guide. b) An air-filled rectangular wave-guide has the dimensions 4*3cm. It operates in TE10 Mode. Calculate i) The cut off frequency ii) phase velocity of wave at 5GHz. iii) the guide wavelength at same frequency.	5M 5M	1	2
4	Explain Faraday Rotation principle. Explain the operation of ferrite Gyrator.	10M	2	3
	OR			
5	a) Explain Coupling probes and Coupling Loops. b) Draw the Structure of Magic tee and explain its operation.	5M 5M	2	2

6	Design and explain the working principle of 2-cavity Klystron Amplifier. Estimate the efficiency at ideal cases.	10M	3	3
	OR			
7	Derive the expression for power output and Admittance for Reflex klystron.	10M	3	3
8	Explain the operation and V-I characteristics of GUNN diode with neat diagram.	10M	4	4
	OR			
9	a) Explain the operation of GUNN diode using 2 -valley theory. b) With a neat diagram, explain the construction and working of a cylindrical travelling-wave magnetron. Discuss its output characteristics.	5M 5M	4 4	3 4
10	Draw a neat diagram of microwave test bench and explain about each block along with its features.	10M	5	3
	OR			
11	a) Derive the S-Matrix of Magic TEE. b) Derive the S-Matrix of E-plane tree and discuss its properties.	5M 5M	5	2