R22 Regulation *Subject code: 4E7DA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VII Semester Supplementary Examinations, May 2026

MICROWAVE ENGINEERING

(ECE)

Maximum Marks: 60 Date: 05-05-2026 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)	Why TEM does not exist in rectangular wave guide?	1M	1	1
b)	Mention the application of waveguides.	1M	1	1
c)	Draw the E-plane tee and identify the isolated ports	1M	2	2
d)	What is Faraday rotation?	1M	2	2
e)	What is the differences between Reflex Klystron over 2-cavity Klystron?	1M	3	3
f)	How oscillations are prevented in a Travelling Wave Tube?	1M	3	3
g)	Write down the different types of magnetron	1M	4	4
h)	Give the classification of microwave solid state devices.	1M	4	4
i)	Why isolator is used in microwave bench?	1M	5	5
j)	What is a VSWR meter and how will you determine the VSWR?	1M	5	5

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	Derive the TM mode field equations in rectangular waveguide starting from uniform plane equation.	10	1	3
	OR			
3	A rectangular waveguide with a width of 4cm and a height of 2cm is used to propagate an EM wave in the TE_{10} mode. Determine the wave impedance, phase velocity and group velocity of the waveguide for the wavelength of 6cm.	10	1	3
4	a) Explain the working of Two-hole directional coupler with neat diagram.	5	2	2
	b) Explain the principle of working of rotary phase shifter with neat diagram.	5	2	2
	OR			
5	a) What is gyrator and how it gives the 180 degrees phase shift?Explain.	5	2	2
	b) Explain the working of Magic Tee with neat sketch and discuss any	5	2	3

	one application			
6	a) Discuss in detail the limitations of conventional tubes at microwave frequencies.	5	3	4
	b) Explain the velocity modulation process with suitable equations in two cavity klystron amplifier and derive the equation for output power.	5	3	4
	OR			
7	a) What are the slow wave structures? Why they are needed? Draw different types of slow wave structures.	5	3	2
	b) Explain the working of Reflex klystron with neat diagrams.	5	3	3
8	a) Explain the operation of GUNN diode along with its V-I characteristics.	5	4	3
	b) How cross field is used in magnetron to generate oscillations.	5	4	4
	OR			
9	a) Write detailed notes on Ridley-Watkins-Hilsum (RWH) theory.	5	4	2
	b) What are the different modes of operation in Gunn diode? Explain them.	5	4	3
10	Explain the microwave power measurement using Bolometer and thermocouple. Distinguish between the two methods.	10	5	4
	OR			
11	a) Explain in detail the measurement of low and high VSWR with a neat diagram of Bench setup.	5	5	3
	b) Derive the S-matrix of E-plane tee.	5	5	5