*R20 Regulation* *Subject code:3P7DA*

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

## B.Tech VII Semester Regular Examinations, November 2023

## MICROWAVE ENGINEERING

(Electronics and Communication Engineering)

*Maximum Marks: 70* Date:11.12.2023 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) | Bloom Tx |
| 1 | Define the phase and group velocities. | L1 |
| 2 | List the applications of Microwaves. | L1 |
| 3 | Find the resonant frequency of an air-filled cavity resonator with dimensions a=5 cm, b=3 cm and d=4 cm. | L1 |
| 4 | What are the limitations of conventional tubes at microwave frequencies? | L1 |
| 5 | Compare 'O' type and 'M' type tubes. | L1 |
| 6 | Draw typical Applegate diagram for reflex klystron. | L1 |
| 7 | How pi-mode is separated in Magnetron. | L1 |
| 8 | What is GUNN effect? | L1 |
| 9 | Why Isolator is used in microwave measurements. | L1 |
| 10 | What are the possible errors in high frequency measurements? | L1 |
| | Part-B | |
| Answer All the following questions. | (5X10M=50Marks) | |
| 11 | A. Derive the field equations of rectangular waveguide in TM mode. (5M)<br>B. Why TEM wave propagation is not possible in rectangular wave guide. (5M) | L2<br>L1 |
| | OR | |
| 12 | A. Determine the impedance of Rectangular waveguide in TE and TM mode. (5M)<br>B. Show that TM01 and TM10 modes does not exist in a rectangular waveguide. (5M) | L2<br>L1 |
| 13 | A. Describe the working of H-plane Tee and state why it is called shunt Tee. (4M)<br>B. A directional coupler is having coupling factor =10 dB and directivity = 40dB. Determine the power coupled in forward and reverse direction when input power is 10 W assuming the coupler is lossless. (6M) | L2<br>L2 |
| | OR | |
| 14 | A. Draw the structure of Ferrite isolator and explain its working. (5M)<br>B. Explain how Gyrator gives phase shift and explain it with neat diagram. (5M) | L1<br>L2 |

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|---|---|---|
| 15 | How the oscillations are generated in reflex klystron and explain bunching process with applegate diagram and also derive the equation for efficiency. (10M) | L2 |
| | OR | |
| 16 | What are the different modes of operation of TWT and explain them. (10M) | L2 |
| 17 | Draw the characteristics of Gunn diode and explain how negative resistance region is obtained in it? (10M) | L2 |
| | OR | |
| 18 | How cross-field is used to generate oscillations in Magnetron and derive the Hull cut-off condition. (10M) | L2 |
| 19 | How to find Low and high VSWR of a given load at microwave frequencies? Explain. (10M) | L1 |
| | OR | |
| 20 | Explain the block diagram of microwave test bench. (10M) | L1 |