

**CMR ENGINEERING COLLEGE: : HYDERABAD**  
**UGC AUTONOMOUS**

27/11

**IV-B.TECH-I-Semester End Examinations (Regular) - November- 2024**  
**MICROWAVE ENGINEERING**  
**(ECE)**

[Time: 3 Hours]

[Max. Marks: 70]

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 20 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART-A****(20 Marks)**

1. a) State the Maxwell's equations in frequency domain. [2M]
- b) Recall the various applications of Microwaves. [2M]
- c) Mention the various aperture types. [2M]
- d) Explain the importance of Isolators [2M]
- e) What is meant by bunching process and transit time? [2M]
- f) Compare O type and M type Microwave tubes. [2M]
- g) Explain cross field effects. [2M]
- h) Identify the few differences between microwave transistors and TEDs [2M]
- i) How do you measure high VSWR? [2M]
- j) List out the properties of S – matrix. [2M]

**PART-B****(50 Marks)**

- 2.a Derive the equation for the propagation of TE waves in rectangular waveguide. [6M]
- b. The dimensions of a guide are 2.5x1 cms. The frequency is 8.6 GHz. Find the cutoff frequencies for TE<sub>10</sub> and TE<sub>01</sub> mode. [4M]

**OR**

- 3.a. Express the equation for cut off wave length in TM mode. Deduce which **TM<sub>mn</sub>** mode has the highest cutoff wavelength. [5M]
- b. Illustrate the working of Microstrip line. Draw its field distribution diagram. [5M]
- 4.a. Describe the cavity resonator with neat sketch and mention it's applications. [5M]
- b. Construct the H plane microwave tee, whose rectangular slot is cut both along the width and breadth of long waveguide dimension, Describe in detail. [5M]

**OR**

5. Write a short notes on the following wave guide attenuator [10M]
  - (i) Resistive cards (ii) Rotary Vane
- 6.a. Discuss in detail about the working of Reflex Klystron and modes of oscillation with neat Applegate diagram. [5M]
- b. A two-cavity klystron amplifier has the following characteristics: [5M]
 

Voltage gain = 15 dB, Input Power = 5 mW, Rsh of input cavity = 30 k ohm, Rsh of output cavity = 40 k ohm, load impedance = 40 k ohm. Find its input rms voltage and the output rms voltage.

**OR**

7. Draw the schematic diagram of helix traveling-wave tube and explain its functionality. [10M]
- 8.a. Illustrate the PI-Mode operation of Magnetron. [5M]
- b. Discuss the difference between transferred electron devices and avalanche transit time devices. [5M]

**OR**

9. Describe the modes of operation for Gunn diodes. [10M]
- 10.a. With the help of wave meter method explain the microwave frequency measurement. [5M]
- b. Explain the characteristics of S matrix and derive the S matrix for any one two port junctions. [5M]

**OR**

11. With the help of a neat sketch, briefly explain the functions of different blocks of a microwave bench. [10M]

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