III B. Tech II Semester Supplementary Examinations, December -2023
MICROWAVE ENGINEERING
(Electronics and Communication Engineering)

Time: 3 hours   Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
*****

UNIT-I

1. a) Derive the expression for guide wave length of TEmn mode in rectangular wave guide.   [7M]
    b) What are the advantages of dominant mode propagation?   [7M]

(OR)

2. a) What are TEnm and TMnm modes w.r.t a circular wave guide. Sketch the dominant modes.   [7M]
    b) A cylindrical wave guide has a inner radius of 2 cm. Find the cut off frequency for the guide operating in TE11 mode. Calculate λ g and Z_{TE} at 10 GHz ($\lambda 0$ = 3 cm).   [7M]

UNIT-II

3. a) Compare M and O type tubes.   [7M]
    b) Explain Reflex Klystron with neat sketch.   [7M]

(OR)

4. a) What are the limitations in conventional vacuum tubes.   [7M]
    b) A reflex klystron having an accelerated field of 300v oscillates at a frequency of 10GHZ with a retarding field of 500v. If its cavity is retured to 9GHZ. What must be the new value of retarding field fro oscillations in the same mode to take place?   [7M]

UNIT-III

5. a) What are the Characteristics of Slow Wave Structures?   [7M]
    b) Explain the construction & working of TWT.   [7M]

(OR)

6. A helix travelling wave tube is operated with a Beam current of 300mA, beam Votage of 5KV, characteristic Impedance of 20Ω. What length of helix will be Selected to give an output power gain of 500db at 10GHz.   [14M]

UNIT-IV

7. a) What is Magic Tee? Explain it and write the applications.   [7M]
    b) Discuss about different types of waveguide attenuators.   [7M]

(OR)

8. a) Explain the coupling factor and directivity of the four ports directional coupler. Also derive the S-matrix for completely matched four-port directional coupler.   [7M]
    b) Describe the structure of Waveguide irises, Tuning Screws and Posts with diagrams.   [7M]

UNIT-V

9. a) Derive the criterion for classifying the modes of operation for Gunn effect diodes   [7M]
    b) An n-type GaAs Gunn diode has following parameters Electron drift velocity Vd = 2.5 × 105m/s Negative Electron mobility |μn| = 0.015 m2/ v s Relative dielectric constant εr = 13.1 Determine the criterion for classifying the modes of operation.   [7M]

(OR)

|'"'|'|'|''||''"||||

10. a) The calibrated power from a generator as read at the power meter is 25mw. When a 3dB attenuator with a VSWR of 1.3/1 is inserted between the generator and detector what value should the power meter read?   [7M]

    b) Compare the power ratio and RF substitution methods of measuring attenuation provided by the microwave component.   [7M]