

Exam.Code:0930  
Sub. Code: 7030

1079

B.E. (Electronics and Communication Engineering)  
Sixth Semester

EC-608: Microwave Engineering

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.  
x-x-x

Attempt the following:-

- I. a) Define velocity modulation in context of microwave tubes.
- b) Compare frequency pulling and frequency pushing.
- c) What is magic Tee? Why it is called so?
- d) Define important parameters of a four port directional coupler.
- e) Classify different operating modes of Gunn diode oscillator.

#### UNIT - I

- II. a) What is meant by, the quality factor of a cavity resonator? Derive a relation between loaded and unloaded quality factor. In addition, describe coupling coefficient, under coupled, over coupled and critical coupling.
- b) What is a directional couple? Derive the scattering matrix for a directional coupler. (6,4)
- III. a) Describe how the power of a microwave generator can be measured using bolometer and calorimeter techniques. How do you extend the range of power measurement?
- b) What are MESFETS? Explain construction, operation, performance characteristics and their applications. (5,5)
- IV. a) Define Faraday rotation; explain working of rotary wave precision attenuator.
- b) Derive the condition for negative resistance in Gunn diode. Describe the several domain formation modes of a Gunn diode. (5,5)

#### UNIT - II

- V. a) An 8  $\mu\text{m}$  long Si BARITT diode has relative dielectric constant of 10.5 and donor concentration of  $3.5 \times 10^{22}/\text{m}^3$ . Calculate the breakdown electric field for the diode.
- b) Differentiate strip line and microstrip line. Discuss different types of strip line. (5,5)

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- VI. a) With suitable diagram, describe the basic operation of helix travelling wave tube.
- b) A pulsed cylindrical magnetron is operated with the following parameters; anode voltage 25 kV, beam current 25 A, magnetic density  $0.34 \text{ Wb/m}^2$ , radius of cathode cylinder 5 cm and radius of anode cylinder is 10 cm, calculate the cut-off magnetic flux density. (5,5)
- VII. a) Starting from the basic principles derive an expression for the efficiency of a two cavity klystron amplifier.
- b) A strip line has been designed with a dielectric substrate having relative permittivity 10.5, thickness 3.1 mm and strip width 2.5 mm. Calculate the characteristics impedance of the line. (6,4)

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