

Roll No

Give a brief description of blocks of microwave bench and their features? What precautions should be taken while measuring the parameters at microwave frequencies? Calculate the VSWR of a transmission system operating at 15 GHz. The TE_{10} mode is propagating through the waveguide of dimensions 4.0 and 2.1 cm respectively. The distance between two successive minima is 1.5 mm.

EC - 704**B.E. VII Semester**

Examination, December 2015

Microwave Engineering*Time : Three Hours**Maximum Marks : 70*

- Note:* i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
 ii) All parts of each question are to be attempted at one place.
 iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.
 iv) Except numericals, Derivation, Design and Drawing etc.

UNIT – I

1. a) Write about strip lines.
- b) Write properties of rectangular waveguides.
- c) How does wave propagation takes place through a waveguides?
- d) Discuss mathematically the propagation of electromagnetic waves in a rectangular waveguide and obtain equations for TE_{mn} modes.

OR

A rectangular waveguide has a cross-sectional area of $2.29 \times 1.45 \text{ cm}^2$, and the operating frequency is 10 GHz, Calculate the following:

- i) Cut-off wavelength
- ii) Cut-off frequency
- iii) Angle of incidence
- iv) Guided wavelength
- v) Phase velocity
- vi) Phase shift constant
- vii) Wave impedance of the guide

UNIT – II

2. a) Define the following wave-guide components.
- i) Flanges
 - ii) Bends
- b) Derive general equations for a scattering matrix.
- c) Write about Magic Tee?
- d) Explain working of directional coupler. Derive its scattering matrix.

OR

Explain the following :

- i) Waveguide Attenuators
- ii) Ferrites

UNIT – III

3. a) What is a MASER?
- b) What is a parametric amplifier?
- c) Write a note on PIN diodes.
- d) Write a brief note on LASER. What is a negative resistance phenomenon?

OR

Give classification of solid-state devices. And write their applications. What are Transferred Electron Devices (TED's)? Discuss RWH theory?

UNIT – IV

4. a) How interaction of electron beam takes place with an electromagnetic field?
- b) Differentiate between planar and cylindrical magnetrons?
- c) What is Rising sun cavity and strapping?
- d) Write about travelling wave tubes under the following:
- i) Significance of TWT
 - ii) Structure of TWT and amplification process
 - iii) Principle of working
 - iv) Gain considerations
 - v) Suppression of oscillations
 - vi) Nature of the four propagation constants

OR

What are the limitations of conventional tubes at microwave frequencies? Explain reflex klystron under the following:

- i) Block diagram
- ii) Working principle
- iii) Mathematical analysis

UNIT – V

5. a) Write about Detector mounts?
- b) What is a slotted line?
- c) What is a VSWR meter?
- d) Explain measurement of wave-guide impedance at load port by slotted line? Calculate the VSWR of a rectangular guide of $2.5 \text{ cm} \times 1.0 \text{ cm}$ operating at 10 GHz. The distance between twice minimum power points is 1 mm.

OR