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.

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Roll No .....

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 2.29×1.45 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 cm × 1.0 cm operating at 10 GHz. The distance between twice minimum power points is 1 mm.

OR