5E 5025

B. Tech. V Semester (Main/Back) Examination, Dec., 2014

ELECTRONICS & COMMUNICATION ENGINEERING # SEC5A

MICROWAVE ENGINEERING-I

Time : 3 Hours Min. Passing Marks : 24 Maximum Marks : 80

Instruction to Candidates :

*Attempt any five questions, selecting **one** question from **each** unit. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit–'I'

1. (*a*) Derive expressions for the fields in rectangular waveguide in case of Transverse Magnetic (TM) wave. [8]

   (*b*) Draw the field lines for:
   (i) TE_{10} mode
   (ii) TM_{11} mode
   (iii) TE_{20} mode
   (iv) TM_{21} mode in a rectangular waveguide. [8]

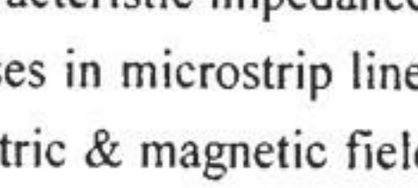
OR

1. (*a*) Explain the following terms with respect to microstrip transmission lines:
   (i) Effective dielectric constant.
   (ii) Characteristic impedance.
   (iii) Losses in microstrip lines.
   (iv) Electric & magnetic field lines. [8]

   (*b*) Find the characteristics impedance of microstrip line that is fabricated on dielectric substrate having $\varepsilon_r = 3.2$, w = 1.78mm, h = 0.762mm and operating frequency is 5 GHz. [8]

Unit–'II'

2. (*a*) Find the z-parameter of the two-part T-network shown in figure:



   [8]

   (*b*) A certain two-port network is measured and the following scattering matrix is obtained:

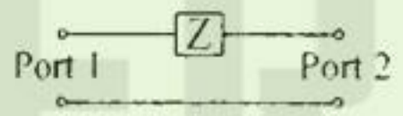
$$[S] = \begin{bmatrix} 0.1\angle 0 & 0.8\angle 90^\circ \\ 0.8\angle 90^\circ & 0.2\angle 0 \end{bmatrix}$$

   From this data, determine whether the network is reciprocal or lossless. [8]

OR

2. (*a*) Does a nonreciprocal lossless network always have a purely imaginary impedance matrix? [8]

   (*b*) Find the S-parameter for the series load shown below. Assume a characteristic impedance z_0.



   [8]

Unit–'III'

3. (*a*) Write s-matrix and explain the working of magic tees. [8]

   (*b*) Draw the directional coupler and explain return loss, directivity, coupling and isolation. [8]

OR

3. (*a*) Design a 3dB branch line coupler. Draw its layout using microstrip line. [8]

   (*b*) Draw the Wilkinson power divider and its layout using microstrip line. [8]

Unit–'IV'

4. (*a*) Describe the microwave power measurement. [8]

   (*b*) Calculate the VSWR when the distance between half power points is 1mm. Assume the wave is in dominant mode and given that the dimension of the guide are 4 × 2.5 cm and frequency is 10 GHz. [8]

OR

4. (*a*) Explain the measurement using network analyzer. [8]

   (*b*) What is low VSWR? Describe its measurement. [8]

Unit–'V'

5. (*a*) List the basic materials for MMICs. [8]

   (*b*) Describe the MMIC techniques. [8]

OR

5. (*a*) Describe the discrete, integrated, and monolithic microwave integrality circuits. [8]

   (*b*) Discuss the capacitor - film development. [8]