

B. Tech. VI Semester (Main/Back) Exam. May/June, 2013

ELECTRONICS & COMMUNICATION ENGINEERING # 6ECO

MICROWAVE ENGINEERING-II

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

- Why is the microwave single amplitude-modulated by a 1KHz square wave for the microwave measurements in laboratory? If a microwave signal is modulated by a rectangular pulse of width $1\mu\text{s}$ with pulse repetition rate of 500 pulses per second, and the average power is 200W. Calculate the peak power. Explain a method for power measurement of such high power levels with the help of diagram. [2+2+4=8]
 - Explain the impedance and VSWR measurements using the slotted line method. [4+4=8]

OR

- Explain the various methods of microwave frequency measurements. [8]
 - Explain the setup and procedure for the measurement of Scattering parameters. [8]

Unit-II

- List the advantages and disadvantages of using planar transmission lines. [8]
 - Draw the schematic diagrams of electric field formations in each of the microstrip line, shielded stripline, slot line and coplanar lines. [2×4=8]

OR

- Explain the various types of losses in microstrip lines. [8]
 - A gold parallel strip line has the following parameters : relative dielectric constant of polyethylene $C_{rd} = 2.25$, strip width $w = 25\text{mm}$ and separation distance $d = 5\text{mm}$. Calculate the (i) characteristic impedance of the strip line, (ii) strip-line capacitance, (iii) strip-line inductance, (iv) Phase velocity. [2×4=8]

Unit-III

- Give reasons why the h, Y and Z parameters cannot be measured at microwave frequency range? What makes S-parameters of use in analyzing microwave circuits? [2+2=4]
 - Express the insertion loss, attenuation, reflection

loss and return loss in terms of S-parameters. [1×4=4]

- Express the S-parameters in terms of Z ABCD parameters. **OR** [4+4=8]
- Explain briefly the properties of S-parameters for an N-port network if it is : (i) Perfectly matched, (ii) Reciprocal, (iii) Lossless. [2×3=6]
 - What are the discontinuities and their effects in waveguides? [3=3=6]
 - How can the dimensions of the discontinuities be designed so as to minimize the reflections from them? [4]

Unit-IV

- Discuss the fundamental differences between the microwave transistors and the transferred electron devices (TEDs), with examples of each type. [4]
 - Though both the tunnel diode and Gunn diode exhibit negative resistance, how do they differ in construction? Explain the tunneling effect and Gunn effect briefly with the help of diagrams. [2+2+4+4=12]

OR

- Compare the construction, operation and applications of MASER and LASER. [6+6=12]
 - Sketch the schematic diagram of a GaAs MESFET and list its characteristics. [6+6=12]

Unit-V

- List the properties of the dielectric materials and resistive materials of MMIC along with suitable example of each type. [4+4=8]
 - Describe the steps for MOSFET fabrication with the help of diagrams. [8]

OR

- List and draw the various configurations of planar resistor, planar inductor and planar capacitor films. [2×3=6]
 - What are Hybrid Integrated Circuits? Discuss their advantages, applications and fabrication techniques in brief. [2+2+2+4=10]