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M.E. DEGREE EXAMINATION, MAY/JUNE 2007.

Second Semester

Communication Systems

CO 1652 — MICROWAVE INTEGRATED CIRCUITS

(Regulation 2005)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Write down the three techniques of mounting chips on metallized substrates of hybrid MICs.

2.   Give two basic differences between 'thick film technology' and 'thin film technology'

3.   Write down the usage of dielectric layers in MIC technology.

4.   What are the application of 'ion implantation'?

5.   Draw the cross section of a micro strip line and indicate the field lines.

6.   Define effective dielectric constant (in terms of capacitances) of a micro strip line.

7.   Express the transmission coefficient Γ in terms of ABCD parameters.

8.   If the coupling coefficient of a coupled micro strip directional coupler is 3 dB, what is its even mode characteristics impedance?

9.   Write down the relationship between various Quality factors.

10. Give the expression of a short open circuited lossless transmission line.

PART B — (5 × 16 = 80 marks)

11. (a) List out the salient properties of 'Dielectric substrates' of Microstrips and describe the same. (16)

Or

(b) Describe with comparison of the following :

   (i) Thermo compression Bonding

   (ii) Ultrasonic Bonding

   (iii) Step welding. (16)

12. (a) (i) Write down the basic principles and main features of ion-implantation. (8)

   (ii) W.r.t. ion-implantation write about 'Lattice damage and annealing'. (8)

Or

(b) Write in detail on the 'Diffusion' w.r.t. the formation of p-n junctions in Semi conducting materials. (16)

13. (a) (i) Draw the cross section of Slot line, Coplanar waveguide and indicate the field lines. What are the modes of propagation in each?

   (ii) What is the mode of propagation in Micro strip line? Explain.

   (iii) Write down the basic differences between strip line and Micro strip line. (16)

Or

(b) Describe the HYBRID —MODE Analysis of shielded micro strip line with particular reference to

   (i) Formulation of the problem (8)

   (ii) Fourier analysis method. (8)

14. (a) (i) Obtain Odd mode and even mode impedances and the length of a 10 dB coupled micro strip (backward wave coupler) coupler. (assume the frequency of operation is 3 GHz, effective dielectric constant as 4.) (8)

   (ii) Indicate how the width and the spacing can be calculated. (8)

Or

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(b) For a coupled micro strip Directional coupler obtain the following relationships.

(i) Characteristics Impedance in terms of odd and even mode impedances. (8)

(ii) The output in the coupled port in terms of the input voltage and the electrical length θ. (8)

15. (a) (i) Design and draw the lay out of a micro strip branch line 3 dB coupler at 9 GHz with an effective dielectric constant of 9. (the width of 50 ohms line as 2mm, and that of lower impedance as 3 mm) (8)

(ii) Derive the design formulae used in the above problem 15 (a) (i). (8)

Or

(b) With suitable expressions describe the design of resistor, Inductor and capacitor for MICs. (16)

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