

**COM506 MICROWAVE INTEGRATED CIRCUITS**

**Part A ( 10x2=20 Marks)**

1. What are the advantages of Microwave Integrated Circuits?
2. Mention any two advantages of Gallium Arsenide.
3. What is a dielectric substrate?
4. What is Lattice damage?
5. Define quasi TEM mode.
6. What is the significance of Method of Images?
7. What are coupled microstrip lines?
8. Sketch the electric and magnetic field distributions in a microstrip.
9. What are the three main types of strip lines?
10. Using Schematic diagram, show the microstrip realizations of a resistor.

**Part – B ( 5 x 16 = 80 Marks)**

- 11.
- (a) Explain the fabrication process of an (i) MMIC (ii) Hybrid MIC. (8+8)
- (or)
- (b) Explain in detail about (i) Thin Film and Thick Film technology (5+5)
- (ii) Encapsulation and mounting of devices (6)
- 12.
- (a) (i) Discuss in detail about the Epitaxial Growth. (10)
- (ii) Explain the Range Versus Energy Relationship. (6)
- (or)
- (b) Explain in detail about Diffusion and Ion Implantation.
- 13.
- (a) A microstrip line is to be designed and its specifications are :

Strip thickness  $t \leq 0.005h$ , substrate board Alumina, Substrate relative dielectric constant  $\epsilon_r = 10$ , Ratio of  $w/h = 0.95$ . Compute (i) the effective relative dielectric constant (ii) the characteristic impedance (iii) the phase velocity and (iv) the wavelength. (4+4+4+4)

(or)

(b) With the help of quasi static analysis for a coplanar waveguide using conformal mapping method, determine the characteristic impedance and phase velocity.

14.

(a)(i) Describe the fundamental mode of propagation in microstrip line. Explain using schematic diagram the nature of current distributions on the conductors for this mode. Show graphically how the characteristic impedance varies with the line dimensions and dielectric constant. (8)

(ii) What are the losses exist in microstrip lines and how they are expressed? (8)

(or)

(b) (i) With neat sketch, explain the odd mode and even mode analysis to find the coupling coefficient and directivity of coupled microstrip directional coupler. Explain its bandwidth characteristics. (10)

(ii) Prove that a quarterwave microstrip line of characteristic impedance  $z_0 = (z_1 z_2)^{1/2}$  can be connected between two infinite microstrip lines of impedances  $z_1$  and  $z_2$  for impedance matching. (assume lossless line). (6)

15.

(a) Explain in detail about Microstrip (i) Circulators (ii) Isolators (iii) Phase Shifters. (5+5+6)

(or)

(b) (i) An interdigitated capacitor fabricated on a GaAs substrate has the following parameters: Number of fingers (N) =8, Relative dielectric constant of Ga As ( $\epsilon_r$ ) = 13.10, Substrate Height (h)=0.254 cm, Finger Length (l) =0.00254 cm, Finger-base width (W) = 0.051 cm. Compute the capacitance. (6)

(ii) Write a note on Microstrip based Flat Inductors and sandwich capacitors. (10)