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6E3085

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B.Tech VI Semester (Main/Back) exam. May, 2012

Electronics & Communicatint
6ECI Microwave Engg.-II

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

Instructions to Candidates:

Attempt any five questions, selecting one question from each unit. All Question 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 clerly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. _____ Nil _____ 2. _____ Nil _____

Unit - I

1. (a) Discuss the Network analyser setup for the measurement of Scattering parameters. 8
- (b) In a SWR measurement at 10 GHz , the distance between the successive minima is 0.1 cm . Inside dimension of waveguides are 4 cm and 2 cm respectively. TE_{10} mode is propagating through the waveguide. Calculate the VSWR. 8

Or

1. (a) How can we measure power of micro wave signals using –
 - (i) Bolo meter
 - (ii) Thermocouple

(iii) Calorimeter-Wattmeter 4x3

(b) In a Calorimeter – Wattmeter power measurement system, mass of water taken is 1000 gm and rise in temperature is 100°C. Calculate the amount of incident microwave power. 4

Unit - II

2 (a) :- Discuss different type of losses occurred in Microstrip lines, along with necessary relation. 12

(b) A certain micro strip line has the following parameters-

$$\epsilon_r = 5.23 \quad t = 2.8 \text{ mils}$$

$$h = 7 \text{ mils} \quad w = 10 \text{ mils}$$

calculate the characteristic Impedance (Z_0) of the line. 4

Or

2. (a) What do you mean by parallel strip lines. Explain. 4

(b) Derive the relation for character Impedance and attenuation losses of a parallel strip line. 6

(c) A shielded strip line has the following parameters -

$$\epsilon_r = 2.56$$

$$w = 25 \text{ mils} \quad (\text{strip width})$$

$$t = 14 \text{ mils} \quad (\text{strip thickness})$$

$$d = 70 \text{ mils} \quad (\text{shield depth})$$

Calculate – (i) k factor

(ii) Frindge capacitance

(iii) Characteristic Impedance of the line 6

Unit-III

3. (a) Discuss ABCD matrix analysis of two port networks . 8
(b) Briefly explain , all possible discontinuities , which can occur in waveguides . 8

Or

3. (a) What are Reciprocal Networks ? Explain . 4
(b) How can we say , Directional coupler is a reciprocal multipart junction. Explain its construction and Working. 12

Unit-IV

4. (a) Define the term Negative Resistance . Name the diode which works on the principle of Negative resistance. 4
(b) Discuss TRAPATT diodes on the basis of following points -
(i) Physical structure
(ii) Principle of operation
(iii) Power output & Efficiency 12

Or

4. (a) Explain the working of Tunnel diode. Draw the energy band diagram under different bias conditions . 8

- (b) A Silicon IFET at 300°K has the following parameters -

Electron density (Nd) = $1 \times 10^{17} \text{ cm}^{-3}$

Hole density (Na) = $1 \times 10^{19} \text{ cm}^{-3}$

Relative dielectric constant (Er) = 11.8

Channel height (a) = $0.2 \times 10^{-4} \text{ cm}$

Channel length (L) = $8 \times 10^{-4} \text{ cm}$

Channel Width (z) = $50 \times 10^{-4} \text{ cm}$

Electron Mobility (μ_n) = $800 \text{ cm}^2/\text{v.s}$

Drain Voltage (Vd) = 10 V

Gate Voltage (Vg) = -1.5 V

Calculate :- (i) Pinch off Voltage (ii) Pinch off current

(iii) Built in Voltage (iv) Drain current

(v) Saturation drain current at Vg = 0 (iv) Cut off frequency

8

Unit-V

5. (a) Discuss different type of MMIC fabrication techniques . 10

(b) Categorise the materials available for MMIC and give their characteristics. 6

Or

5. (a) What is the use of planar inductor films in their film formation. 2

(b) Explain different type of Inductor film available , along with required expressions. 10

(c) An Interdigitated capacitor fabricated on a GaAs substrate has the following parameters -

Number of fingers (N) = 8

Relative dielectric constants of GaAs (Er) = 13.10

Substrate height (h) = 0.254 cm

Finger Length (l) = 0.00254 cm

Finger base width (w) = 0.051 cm

Compute the capacitance. 4