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Reg. No. : .....

Name : .....

Seventh Semester B.Tech. Degree Examination, June 2016
(2008 Scheme)
08.703 : MICROWAVE ENGINEERING (T)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions :

1. Show that reentrant cavity can support infinite number of frequencies/modes of oscillation.

2. Draw the applegate diagram for $1\frac{3}{4}$ mode in reflex klystron.

3. Differentiate between cross-field tube and linear beam tubes

4. Write note on slow wave structure.

5. A Si npn bipolar transistor have the parameters

   Collector current $I_C = 6$ mA

   C.E. current gain factor hfe = 120

   T = 300 k

   Cross sectional area $w_b = 10^{-8}$ cm^2.

   Find (a) mutual conductance g_m and (b) diffusion capacitance C'_{be}.

6. A certain Si micro wave transistor has the following parameters : reactance, $X_c = 1\,\Omega$; transit time cutoff frequency, fr = 4 GHz; maximum electric field, $E_m = 1.6 \times 10^5$ V/cm saturation drift velocity, vs = 4×10^5 cm/s. Determine maximum allowable power that transistor can carry.

7. A certain GaAs MESFET has the parameters channel height, a = 0.1 μ m, electron concentration, $N_2 = 8 \times 10^{17}/cm^3$; $E_r = 13.10$.

   Calculate pinch off voltage.

8. a) List the need for S-parameters at microwave frequencies.

   b) Draw the S parameter block representation of 2 port network.

9. Write note on Corners, bends and twists.

10. Write note on protection switching arrangements in microwave communication system. **(10×4=40 Marks)**

PART – B

Answer **any 2** questions from **each** Module.

Module – I

11. Explain in detail velocity modulation and bunching process in 2 cavity klystron system. 10

12. Explain the working of Reflex Klystron, velocity modulation. Arrive at expressions for power output and efficiency. 10

13. A TWT operates under the following parameters :

    beam voltage $V_0 = 3$ kV; beam current, $I_0 = 30$ mA, characteristic impedance of helix; $Z_0 = 10\Omega$; circuit length, N = 50; frequency, f = 10 GHz. Determine (a) gain parameter C (b) output power gain Ap in dB and (c) all four propagation constants. 10

Module – II

14. Explain the working of magnetron oscillators. Why mode strapping is used ? 10

15. Derive the Hull cut off voltage equation for cylindrical magnetron. 10

16. An n-Ge-p-Ga As-n-GaAs HBT at 300 k has the parameters;

Donor density in n-Ge region, $N_d = 5 \times 10^{18}/cm^3$

Acceptor density in p-Ga As region, $N_a = 6 \times 10^{16}/cm^3$

Hole life time , $Z_p = 6 \times 10^{-6}$ s

Bias voltage at emitter junction, $V_E = 1V$

Cross section $A = 2 \times 10^{-2}$ cm^2.

Compute (a) built in voltage in the p-GaAs side (b) hole mobility (c) hole diffusion constant (d) minority hole density in n-Ge region. 10

Module – III

17. Explain the working of Faraday rotation isolator with diagram. 10

18. a) Derive S-matrix of 2 hole directional coupler. 7

b) Show that a 3 port circular can function as an isolator. 3

19. With simple microwave laboratory bench set-up

a) How microwave frequency is measured ? 5

b) How microwave power is measured ? 5