(b) Explain high field domain formation in GUNN diode and describe its properties ? **10**

(c) Compare the physical structures of IMPATT and TRAPATT diodes ? **4**

8. (a) Write a note on Parametric Amplifier and derive necessary expressions ? **7**

(b) An up converter parametric Amplifier has the following parameters, :

Ratio of output frequency over signal frequency = 25

Figure of merit = 10

Factor of merit figure = 0.4

Diode temperature = 350°K

Calculate :

(i) Power gain in dB ?

(ii) Noise figure in dB ?

(iii) Bandwidth ? **3×3=9**

(c) Discuss in brief the operation of BARITT diode. **4**

http://www.kuonline.in

Roll No. ..... **Total Pages : 04**

BT-7/D-13 **8711**

MICROWAVE ENGINEERING

ECE-407-E

Time : Three Hours] [Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Section. All questions carry equal marks.

Section I

1. (a) Give structural description of co-planar wave guide. What are its basic types and give its advantages ? **8**

(b) An air filled circular cavity has a length of 2.3 cm and radius of 1.15 cm. Find the resonance frequencies for modes TM_{010} and TE_{111} ? **5**

(c) Describe various methods of excitation and coupling of resonator cavities ? **7**

2. (a) Explain any *two* methods to measure microwave power using necessary block diagrams. **5+5**

http://www.kuonline.in

(b) Calculate the VSWR when the distance between half power points is 1 mm. Assume the wave is in dominant mode and given that the dimensions of guide are 4×2.5 cm and frequency is 10 GHz ? **5**

(c) Compare the Slotted line and Magic Tee methods for impedance measurement ? **5**

Section II

3. (a) Derive the expressions for Bunching Process in a two cavity Klystron Amplifier ? **10**

(b) Derive expressions for output power of a four cavity Klystron's amplifier ? **4**

(c) Find the power gain in dB of the TWT having V_0 = 10 kV, I_0 = 500 mA, f = 10 GHz, Z_0 = 25Ω and an interaction space of 20 cm length ? **6**

4. (a) Describe the Wave Modes in TWT and derive necessary expressions for the same ? **7**

(b) Derive expressions for Hull Cut-off voltage for Cylindrical Magnetron with necessary diagram ? **7**

(c) A linear magnetron is operating in π-mode and has the following specifications N = 10, V_0 = 18 kV, f = 3MHz, B_0 = 0.2 wb/m^2, d = 5 cm. Determine angular velocity of electron, the radius at which radial forces due to electric and magnetic fields become equal and opposite ? **6**

Section III

5. (a) Prove that, for a reciprocal junction the scattering matrix is symmetrical provided the equivalent voltages have been chosen so that power into port n is given by $\frac{1}{2}IV_nI^2$? **6**

(b) Derive Return loss, Transmission loss and Insertion Loss in terms of S-parameter ? **3×2=6**

(c) Determine the S-matrix of an ideal lossless match terminated Directional Coupler with coupling of 10 dB and directivity of 30 dB ? **8**

6. (a) Describe working of Faraday Rotation Isolator by giving its structural details using necessary diagram ? **8**

(b) Explain the properties of Magic TEE and derive S-matrix of an Ideal magic Tee ? **5**

(c) Explain working of Hybrid Ring using necessary structural details with diagrams and derive its S-matrix ? **7**

Section V

7. (a) A GUNN diode is working in transit time modes at 12 GHz. The domain of charges moves at 10^7 cm/sec speed. Calculate :

(i) Length of Device ?

(ii) In what modes derive can work at 10 GHz and 14 GHz ? **6**