Roll No. ....

Total Pages : 03

BT-7/M-18   37011

MICROWAVE ENGINEERING
ECE-407-E (Opt. II)

Time : Three Hours]   [Maximum Marks : 100

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

Unit I

1. (a) Explain the operation of co-planar wave guide with necessary expressions.   **10**

   (b) Derive the expressions for Q-factor for a cylindrical cavity resonator.   **10**

2. (a) Explain the method of measurement of Low VSWR with necessary expressions.   **10**

   (b) Explain the power ratio method for the measurement of attenuation in detail.   **10**

Unit II

3. (a) Derive the expressions for beam current density in Multi-cavity Klystron Amplifier.   **10**

(3-59/4) L-37011   P.T.O.

(b) A Reflex Klystron operates under the following conditions :

$V_0 = 600$ V, $L = 1$ mm, $R_{sh} = 15$ kΩ and frequency of operation (f_r) is 9 GHz. The tube is oscillating at f_r at the peak of $n = 2$ and $1\frac{3}{4}$ mode. Transit time through cavity gap and beam loading effects are small. Find the value of Repeller voltage, Direct current required to give a microwave gap voltage of 200 V and Electronic efficiency.   **10**

4. (a) Explain the amplification process in Helix Travelling wave tube.   **10**

   (b) Derive the expressions for Hull cutoff voltage and Magnetic equations in detail.   **10**

Unit III

5. (a) Prove that for a reciprocal network the scattering matrix is symmetrical provided the equivalent voltage have been chosen such that the power into port n is given by $\frac{1}{2}\left|V_n^+\right|^2$.   **10**

   (b) Explain the design procedure of microwave low pass filter for coaxial π and T sections.   **10**

L-37011   2

6. (a) Explain the operation of precision variable Rotary Phase Shifter with the detailed description of each of plate. 10

(b) Explain the working of Magic Tee and derive its S-matrix with numerical values. 10

Unit IV

7. (a) Explain structure of GUNN diode and the high field domain formation in it. 10

(b) An IMPATT diode has the following parameters : Carrier drift velocity = 10^5 m/s, length of drift space = 5 μm, maximum operating current = 150 mA, maximum operating voltage = 80 volt, Efficiency = 10%. Calculate :

(i) CW Power output.

(ii) Frequency of oscillation produced. 5

(c) List the applications of IMPATT diode. 5

8. Explain the physical structure and principle of operation of the following : 2×10=20

(a) TRAPATT Diode

(b) BARITT Diode.