47011

BT-7/M21 MICROWAVE ENGINEERING

Paper-ECE-407 E

Option-II

Time allowed : 3 Hours

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

UNIT-I

- (i) An air filled rectangular copper waveguide with dimensions 2×1 cm² operates in the dominant mode at rate of 1 hp. The signal frequency is 30 GHz. What is the peak value of the electric field occurring in the waveguide?
 - (ii) Define the Quality Factor. Differentiate between loaded and unloaded quality factors? On what factors the value of a quality factor depends?
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2. Explain the followings :

- (i) Microwave Power Measurements. 10
- (ii) Dielectric Measurements.

UNIT-II

- 3. (i) Explain the working of Multicavity klystron and derive expressions for beam current density. 10
 - (ii) A reflex klystron is operated at 9 GHz with $V_0 = 600$ V, repeller spacing of 1 mm, $R_{sh} = 15K\Omega$ and N = 13/4. Calculate :
 - (a) the repeller voltage
 - (b) the dc current necessary to produce microwave gap voltage of 200V
 - (c) the maximum efficiency. Assume $\beta o = 1$. 10
- 4. (i) Explain the working of cylindrical magnetron with its constructional details. 10
 - (ii) A Helix travelling wave tube operates with $V_0 = 4kV$, $I_0 = 4$ mA, f = 10GHz, $Z_0 = 25 \Omega$, N = 50. Compute :

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Maximum Marks : 100

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- (a) gain parameter C
- (b) power gain in dB.

UNIT-III

- 5. (i) Explain the design procedure of microwave low pass filter for coaxial π and T sections. 10
 - (ii) Explain the working of Magic Tee and derive its S-matrix with numerical values by assuming that any two ports are perfectly matched.

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- 6. (i) What do you mean by an Attenuator? Explain the working of a precision variable attenuator and derive its S-Matrix. 10
 - (ii) Write the scattering matrix for an ideal 4 port circulator and explain how a four port circulator can be used as a 3-port circulator? 10

UNIT-IV

- 7. (i) Explain the GUNN effect and give the structure configuration of GUNN diode? 10
 - (ii) An IMPATT diode has a pulsed operating voltage of 120V and pulsed operating current of 0.8A. The efficiency of operation is 15%. Find :
 - (a) the output power
 - (b) the duty cycle if the pulsed width is 0.01 ns and the frequency is 10GHz. 10
- 8. (i) Explain the operation, constructional details with diagram of BAR1TT diode. 10
 - (ii) Compare the CW power, pulsed power, efficiency and noise figure of TRAPATT, IMPATT and BARITT diodes.
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