

Total No. of Questions : 8]

SEAT No. :

P3655

[Total No. of Pages : 3

[4859] - 1038

B.E. (E & TC) (Semester - I)

Microwave Engineering

(2012 Pattern) (End Sem.)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) The TE_{10} mode is propagated in a rectangular waveguide of dimensions $a = 6\text{cm}$ and $b = 4\text{ cm}$, by means of a travelling detector. The distance between a maximum and minimum is found to be 4.55 cm . Find the frequency of the wave. [7]
- b) State different types of stripline and distinguish between Stripline and Microstrip line in detail. [7]
- c) What is the significance of scattering matrix? Write the properties of S-matrix. [6]

OR

- Q2)** a) Explain the terms with respect to waveguide: [7]
- i) Dominant Mode.
 - ii) Cut-off Frequency.
 - iii) Guide Wavelength.
- b) Explain any two applications of circulator. [7]
- c) The collinear ports 1 and 2 of a Magic Tee are terminated by impedances of reflection coefficients $\rho_1 = 0.5$ and $\rho_2 = 0.6$. The difference port 4 is terminated by an impedance with reflection coefficient of 0.8. If 1W power is fed at sum port 3, calculate the power reflected at port 3 and the power divisions at the other ports. [6]

P.T.O.

- Q3)** a) What are the limitations of conventional tubes at microwave frequencies and how to overcome these limitations? [9]
- b) How the oscillations are sustained in Cavity Magnetron? Explain the process of phase focusing effect. [9]

OR

- Q4)** a) Explain the operation of Travelling Wave Tube with its slow wave structure. [9]
- b) A two cavity Klystron amplifier has the following specifications: [9]
- Beam Voltage : $V_0 = 900 \text{ V}$
- Beam Current : $I_0 = 30 \text{ mA}$
- Frequency : $f = 8 \text{ GHz}$
- Gap spacing in either cavity : $d = 1 \text{ mm}$
- Spacing between centers of cavities : $L = 4 \text{ cm}$
- Effective shunt impedance : $R_{sh} : 40 \text{ k}\Omega$
- Determine :
- The electron velocity.
 - The dc transit time of electron.
 - The input voltage for maximum output voltage.
 - The voltage gain in decibels.

- Q5)** a) Draw equivalent circuit of Varactor diode. Explain in detail its construction and operation. [8]
- b) Explain principle of operation, IV characteristics and equivalent circuit of microwave Tunnel diode. [8]

OR

- Q6)** a) Explain Gunn effect using two valley model. Mention its typical characteristic and applications of Gunn diode. [8]
- b) With suitable expression explain power frequency limitations of microwave transistor. [4]
- c) In a Gunn diode with active length $20 \mu\text{m}$, the drift velocity of electrons is $2 * 10^7 \text{ cm/s}$. Calculate natural frequency of the diode and its critical voltage. [4]

- Q7)** a) Explain any two methods of measuring impedance of a terminating load in a microwave system. [8]
- b) Enlist methods of measuring the Q of a cavity resonator. Explain any one method in detail. [8]

OR

- Q8)** a) Explain with neat block diagram power measurement of microwave generator using [8]
- i) Bolometer.
- ii) Calorimeter.
- b) Describe in detail the techniques used for VSWR measurement. [8]



