

Total No. of Questions : 8]

SEAT No. :

**P3045**

**[5154]-613**

[Total No. of Pages : 3

**B.E.(E&TC)**

**MICROWAVE ENGINEERING**

**(2012 Pattern) (Semester-I) (End Semester)**

**Time : 2½ Hours]**

**[Max. Marks : 70**

**Instructions to the candidates:**

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 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)** Why waveguides are required at microwave frequencies? Explain the following parameters of a waveguide. [7]

- i) Phase Velocity
  - ii) Guide wavelength
  - iii) Cut off frequency
- b) Explain the Faraday's rotation principle? Explain in brief the working principle of an isolator. [7]
- c) Explain the properties of E plane Tee with the help of a neat diagram. Also state its Scattering matrix. [6]

**OR**

**Q2) a)** An air-filled rectangular waveguide of inside dimensions  $7 \times 3.5$  cm operates in the dominant TE mode. [7]

- i) Find the cut off frequency
  - ii) Determine the phase velocity of the wave in the guide at frequency of 3.5 GHz.
  - iii) Determine the guided wavelength at the same frequency.
- b) Define with expressions the following parameters of directional coupler. [7]
- i) Coupling Factor
  - ii) Directivity
  - iii) Insertion loss
  - iv) Isolation
- c) When is it necessary to carry out Microwave Network Analysis? [6]

**P.T.O.**

- Q3)** a) What are the high frequency limitations of transistor? Explain the techniques to minimize this along with the performance parameters of transistor at high frequency. [9]
- b) Explain in detail the construction, operation, advantages and applications of a TWT amplifier. [9]

OR

- Q4)** a) A two cavity Klystron amplifier has the following specifications: [10]  
Beam Voltage:  $V_0 = 1000\text{V}$   
Beam Current:  $I_0 = 25\text{mA}$   
Frequency:  $f = 3\text{ GHz}$   
Gap spacing in either cavity:  $d = 1\text{ mm}$   
Spacing between centers of cavities:  $L = 4\text{ cm}$   
Effective shunt impedance excluding beam loading:  $R_{sh} : 30\text{k}\Omega$   
Determine:  
i) The input gap voltage to give maximum output voltage  $V_2$   
ii) Find voltage gain, neglecting the beam loading in the output cavity.  
iii) Find the efficiency of the amplifier, neglecting beam loading.
- b) What are cross field devices? Explain the Cavity Magnetron with Hull cut off condition in detail. [8]

- Q5)** a) Explain the working principle, advantages and disadvantages of Tunnel Diode in detail. [8]
- b) Draw equivalent circuit of Varactor diode. Explain in detail its construction and operation. [8]

OR

- Q6)** a) Explain construction, working and applications of PIN diode in detail. [8]
- b) Write a short note on: [8]  
i) Microwave Transistor  
ii) Schottky Barrier diode.

- Q7)** a) Explain attenuation measurement technique in detail. [8]  
b) Enlist methods of measuring the Q of a cavity resonator. Explain any one method in detail. [8]

OR

- Q8)** a) Write short note on: [8]  
i) Tunable detector  
ii) Microwave Power Measurement  
b) Explain any two methods of measuring Impedance of a terminating load in a microwave system. [8]

