

Total No. of Questions : 8]

SEAT No. :

**P3604**

[Total No. of Pages : 2

**[4959] - 1083**  
**B.E. (E & TC)**  
**Microwave Engineering**  
**(2012 Pattern) (Semester - I)**

*Time : 2½ 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)** Why waveguides are required at microwave frequencies? Explain the following parameters of a waveguide. [7]

- i) Cut-off frequency
- ii) Guide wavelength
- iii) Phase velocity

b) Explain the properties of Hybrid Tee with the help of a neat diagram. Also state its Scattering matrix. [7]

c) An isolator has an insertion loss of 0.5 dB and an isolation of 30 dB. Determine the scattering matrix of the isolator if the isolated ports are perfectly matched to the junction. [6]

OR

**Q2) a)** Show that for a TE<sub>10</sub> mode a frequency of 6 GHz will pass through the guide if a dielectric with relative permittivity of 4 is inserted into the waveguide. The dimensions are a = 1.5cm and b = 1cm. [7]

b) Explain the concept of degenerate and dominant mode for a rectangular waveguide. [7]

c) Explain the properties of Scattering matrix for a multiport network. [6]

**P.T.O.**

- Q3)** a) Explain the concept of velocity modulation with the help of applegate diagram. How this is used for the construction of microwave sources?[9]  
b) What do you mean by linear beam tubes? Explain the construction, operation and advantages of a TWT amplifier. [9]

OR

- Q4)** a) Compare the following microwave devices. [10]  
i) Tunnel diode with normal p-n diode  
ii) IMPATT with TRAPATT  
b) What are the high frequency limitations of transistor? Explain the techniques to minimize this along with the performance parameters of transistor at high frequency. [8]

- Q5)** a) Explain Gunn effect using two valley model. Mention its typical characteristics and applications of Gunn diode. [8]  
b) Draw equivalent circuit of varactor diode. Explain in detail its construction and operation. [8]

OR

- Q6)** a) Explain the phase focusing effect in cavity magnetron. [8]  
b) Explain how PIN diode acts as a modulator. [4]  
c) Write a short note on Schottky Barrier diode. [4]

- 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 explanatory notes on: [12]  
i) VSWR meter  
ii) Tunable detector  
iii) Power meter  
b) What is the need of double minimum method? Explain the same thoroughly. [4]

