

B.E. Sem-7 (Rev.) Microwave Devices & Circuits

17/12/08

N.B. : (1) Question No. 1 is compulsory.

(2) Attempt any **four** questions out of the remaining **six** questions.(3) Assume **suitable** data whenever **necessary** and justify the **same**.

1. Explain in brief (any **four**) :- 20
 - (a) Microwave system
 - (b) Transmission line as resonant circuit
 - (c) Cavity resonator
 - (d) Forward wave crossed-field amplifier
 - (e) Avalanche transit time devices.

2. (a) What is impedance matching ? Explain various methods of achieving impedance matching in transmission lines. 10
- (b) A single short circuited shunt stub is to match a lossless line of 400Ω to a load of $800 - j300 \Omega$. The frequency is 3 GHz. Find (i) The distance in meters from the load to the stub (ii) Length in meters of the short circuited stub. (Use Smith Chart). 10

3. (a) Explain with suitable sketch the mechanism of propagation of EM wave through rectangular waveguide. Hence reason-out why there are different modes of propagation and cut-off frequency for particular waveguide having a definite geometry. Also explain dominant mode, phase velocity and group velocity. 10
- (b) Find transmission modes possible at an operating frequency 3 GHz in hollow rectangular waveguide of inner dimensions 3.44×7.22 cm. Also find corresponding values of phase constant, phase velocity and group velocity. 10

4. (a) What is directional coupler ? What are its characteristics ? Describe use of directional coupler in measurement of unknown impedance using reflectometer technique. 10
- (b) Define a microwave junction. How can it be describe by scattering matrix ? Derive the scattering matrix relation between input and output of a $n \times n$ junction starting with an analogy of transmission line junction. 10

5. (a) Draw schematic of Reflex Klystron showing the various voltages required for its operation. Explain the principle of operation with the help of applegate diagram. Also comment on the shape of the cavity used in reflex klystron. 10
- (b) Explain construction and working of TRAPATT diode with typical characteristics and applications. 10

6. (a) Compare and contrast the velocity modulation in connection with the working of klystron, TWT and cavity magnetron. 10
- (b) Explain different modes of operation in Gunn diode. 10

7. Write short notes on :- 20
 - (a) Strip-type transmission lines
 - (b) Microwave Hazards
 - (c) Circular waveguide and applications
 - (d) VSWR meter.