

- N.B. (1) Question No.1 is compulsory.  
(2) Answer any four out of the remaining six questions.  
(3) Assume any suitable data wherever necessary and justify the same.

Q1. Explain in brief (Any 4) 20M

- Microwave Frequency Band designation and its applications.
- Attenuators.
- Transmission Line resonators.
- Helix TWT.
- IMPATT diode.

Q2a. Derive transmission line equation and prove that it is a low pass filter. 12M

b. A coaxial line has following characteristics.

$$R = 4 \Omega/m$$

$$L = 450 nH/m$$

$$G = 7 \times 10^{-4} \text{ } \Omega/M$$

$$C = 50 \text{ pF/m}$$

Calculate (a)  $Z_0$ ,  $\alpha$ ,  $\beta$ ,  $V_p$  and  $\lambda$  at 1000 MHz

(b) With  $V_0^+ = 10 < 0$  and  $V_0^- = 0$

Calculate  $v$ ,  $I$  and power at  $Z = 4 \text{ m}$

8M

Q3a. What is stub matching. Compare the impedance matching using single stub and double stub. 10M

b) i. Compare typical transmission line with microstrip and stripline.

ii. Explain the concept of sinusoidal excitation and transmission lines. 10M

Q4a. Derive the expression for fields in TE and TM modes of rectangular Waveguide. 12M

b. i) Explain why waveguide cannot support TEM modes. 4M

ii) Represent electric and magnetic field distribution in a rectangular waveguide operating in TE<sub>10</sub> mode using schematic diagram. 4M

Q5a. Why s parameters are used at microwave frequencies? List and explain Properties of s parameter matrix. 12M

b. Explain the working of H plane T and directional coupler using s parameters. 8M

Q6a. Explain the construction and working of Reflex Klystron. 10M

Q6b. Describe the principle of operation for a normal cylindrical magnetron. Derive the Hull cutoff voltage equation. 10M

Q7a. Explain the various modes of operation of a Gunn diode in detail. 10M

b. Explain the techniques for the measurement of antenna gain. 10M