

(3 Hours)

Max Marks: 80

1. Question No. 1 is compulsory.
2. Out of remaining questions, attempt any three questions.
3. Assume suitable additional data if required.
4. Figures in brackets on the right hand side indicate full marks.

Q.1

- (a) What factors limit transistor use at microwave frequencies? [5]
- (b) Explain Doppler shift and its role in CW radar. [5]
- (c) Explain the working of Phase shifter. [5]
- (d) Explain the principle of working of quarter wave transformer. [5]

Q.2

- (a) Explain how avalanche devices operate. Name three devices that use the avalanche mode for their operation. [10]
- (b) Design single-stub (short circuit) shunt tuning networks to match a load impedance  $Z_L = 60 - j80 \Omega$ , to a  $50 \Omega$  line. Assuming that the load is matched at 2 GHz [10]

Q.3

- (a) Explain the working of a negative resistance parametric amplifier. [10]
- (b) Explain the concept of velocity modulation. Also explain the working of cylindrical magnetron. [10]

Q.4

- (a) Derive equation for phase velocity, cutoff frequency, cutoff wavelength and field equations for rectangular waveguide. [10]
- (b) Explain how avalanche devices operate. Name three devices that use the avalanche mode for their operation. [10]

Q.5

- (a) Derive the Radar range equation as governed by minimum detectable signal to noise ratio. [10]
- (b) Draw the functional block diagram of an MTI Radar system and explain its operation. Define the terms blind speed and MTI improvement factor. [10]

Q.6

- (a) Instrument landing system. [5]
- (b) Ferrite device Isolator [5]
- (c) Hybrid ring [5]
- (d) Modes in Gunn diode [5]