

(3 Hours)

Max Marks: 80

- N:B : 1. Question no. 1 is compulsory.
 2. Out of remaining questions, attempt any three questions.
 3. Assume suitable additional data if required.
 4. Figures on the right hand side indicate full marks.

- Q.1 (a) Explain Doppler shift and its role in pulsed and CW radar. [5]
 (b) How does a slow-wave structure operate? [5]
 (c) What are the advantages of more than two cavities in a Klystron? [5]
 (d) Name four categories of transmission lines. What restricts the use of two-wire line in the microwave region? [5]
- Q.2 (a) What are the relationships of the signal, pump and idler frequencies for a parametric amplifier with an idler circuit operated as a degenerate amplifier? [10]
 (b) Derive equation for phase velocity, cutoff frequency, cutoff wavelength and field equations for rectangular waveguide. [10]
- Q.3 (a) Explain the working of TWT. A helix travelling wave tube operates at 4GHz under a beam voltage 10KV and beam current of 500 mA. If the helix impedance is 25 ohms and the interaction length is 20 cm. Find the output power gain in decibels. [10]
 (b) With the help of suitable diagram explain mechanism of operation of Magnetron. What is mode jumping in Magnetron? How are various modes separated? [10]
- Q.4 (a) Explain how avalanche devices operate. Name three devices that use the avalanche mode for their operation. [10]
 (b) Antenna with impedance $40+j30$ ohms is to be matched to 100 ohms lossless line with a shorted stub. Determine: i) Required stub admittance [10]
 ii) Distance between stub and antenna
 iii) Stub length
 iv) Standing wave ratio between stub and load, stub and source, along the stub. (use smith chart).
- Q.5 (a) Derive the Radar range equation as governed by minimum detectable signal to noise ratio. [10]
 (b) With a suitable block diagram explain the working of a conical scan tracking radar [10]
- Q.6 Write short note on:
 i) Modes in Gunn diode [07]
 ii) High electron mobility transistors [07]
 iii) Instrument landing system [06]