

(3 Hours)

[Total Marks: 80]

1. Question number one is compulsory.
2. Out of remaining questions, attempt any three questions.
3. Assume suitable additional data if required.
4. Figures in bracket on right hand side indicate full marks.

- Q. 1A) Give the limitations of conventional vacuum tubes at microwave frequencies. [5]
 B) Explain the working of phase shifter. [5]
 C) Explain the properties of S-parameters. [5]
 D) Explain the terms of frequency pushing and frequency pulling with reference to magnetron. [5]
- Q. 2 A) Derive equation for phase velocity, cutoff frequency, cutoff wavelength and field equations for rectangular waveguide. [10]
 Q. 2 B) Explain the working principle of Reflex Klystron with the Applegate diagram and derive the expression of output power. [10]
- Q.3 A) Explain the working principle of cylindrical magnetron and derive the Hull cut-off magnetic equation of magnetron. [10]
 Q. 3 B) A TE₁₁ mode is propagating through a circular waveguide. The radius of the guide is 5 cm and the contains a air dielectric. Determine [10]
 1) cut off frequency
 2) Guide wavelength for an operating frequency of 3GHz.
 3) Wave Impedance in the Guide
- Q.4 A) Explain the amplification process in Travelling Wave Tube. [10]
 A travelling wave tube has the following characteristics
 Beam Voltage = 3KV, Beam current = 10mA, frequency = 8.5 GHz, Circuit Length N = 42, Characteristic Impedance = 120Ω
 Determine 1) Gain Parameter 2) Power Gain
- Q. 4 B) Describe the operation of the following devices using faraday's rotation principle [10]
 1) Isolator 2) Gyrotator
- Q. 5 A) Name three devices those are using avalanche mode for the operation. [10]
 Explain any one of them in detail.
- Q. 5 B) Explain the working of E and H plane Tee using S-parameters. [10]
- Q.6 Write Short Notes On [20]
 1) Directional Coupler
 2) Gunn Diode
 3) Measurement of VSWR
 4) Microwave frequency bands and applications
