



- (b) Find the group and phase velocity for a waveguide having cross section (4mm × 6mm) and filled with a dielectric material with  $E_r=10$  and  $H_r=1$ .

8

## UNIT - II

- 2 Draw the structure for a
- Wave guide bend with minimum reflection at corner.
  - Two-hole coupled directional coupler.
  - Rat-race structure and
  - Dielectric attenuator.

4×4=16

OR

- 2 Find the S-parameter for a
- E-plane - Tee
  - Circulator
  - H-Plane - Tee and
  - Magic - Tee

4×4=16

## UNIT - III

- 3 Find the expression for current across a catcher cavity in two-cavity klystron. Also deduce the expression for
- depth of modulation
  - bunching parameter

12+2×2=16

OR



- 3 A four cavity cw Klystron amplifier has  
Beam voltage = 20 kV  
Beam current = 2.00 mA  
Gap distance = 0.5 cm  
Operating frequency  $f = 12.5$  GHz  
Signal voltage  $\vartheta_s = 5$  volt (rms)  
Coupling coefficient = 0.6  
dc beam current density  $\rho = 10^{-6}$  c/m<sup>3</sup>

Find :

- (i) Plasma frequency
- (ii) Transit time across input gap
- (iii) DC velocity of electron
- (iv) Phase constants.

4×4=16

#### UNIT - IV

- 4 Draw the construction of a TWT with helix type slow wave structure. Draw the diagram for bunching process in it and explain the role of
- (i) Slow wave structure and
  - (ii) DC-Magnetic field in axial direction in it.

6+6 + 2×2=16

OR

- 4 A TWT has following characteristic  
Beam voltage = 8 kV  
Beam current = 2 mA  
Frequency = 4 GHz  
Circuit length  $N = 40$   
 $Z_0 = 20 \Omega$   
Find :
- (i) gain parameter  $C$  and
  - (ii) Power gain in dB.

2×8=16



UNIT - V

- 5 (a) Give the total classification of various magnetron and give their comparison table.

8

- (b) An  $\alpha$ -band magnetron has

Anode voltage  $V_o = 30$  kV

Beam current  $I_o = 20$  A

Magnetic flux density  $B_o = 0.336$  wb/m<sup>2</sup>

Cathode radius  $a = 2$  cm

radius of vane edge to center  $b = 4$  cm

Find :

- (i) cyclotron Angular frequency  
(ii) cutoff voltage for a fixed  $B_o$ .

8

OR

- 5 Explain the working of a cylindrical magnetron and find expression for

- (i) cyclotron frequency and  
(ii) electronic efficiency of it.

8×2=16

