





b) Explain the structure and application of crystal filter. Design a constant K T-section bandpass filter with cutoff frequencies of 1 KHz and 4 KHz. The design impedance is 600 ohms. (16)

12. a) Derive the equation of attenuation constant and phase constant of transmission lines in terms of line constants R, L, C and G and explain the significance of reflection loss. (16)

(OR)

b) i) Derive the conditions required for distortion less line. (8)

ii) At 6 MHz characteristic impedance of transmission line is  $(20 - j3)\Omega$  and propagation constant is  $0.01 + j0.1$  per meter. Find the primary constants R, L, G and C. (8)

13. a) Explain the procedure of single stub matching using Smith chart and discuss operation of quarter wave transformer. (16)

(OR)

b) Examine the procedure for obtaining the Smith chart using R and X circles. (16)

14. a) Derive the solution for TE and TM mode in rectangular wave guide. (16)

(OR)

b) Discuss velocity, wavelength, mode cut off frequency and dominant modes in waveguides. (16)

15. a) Explain the propagation of electromagnetic waves in a cylindrical waveguides with suitable expressions. (16)

(OR)

b) i) Write short notes on cavity resonators. (4)

ii) Calculate the guide wavelength, phase velocity, group velocity, characteristic impedance for a rectangular waveguide in  $TM_{11}$  mode having dimension  $a = 4.5$  cm and  $b = 3$  cm internally at  $f = 9$  GHz. (12)