B.E. / B.Tech Degree Examination, May/June 2014

Fifth Semester

Electronics and Communication Engineering

EC 2305/EC 55 – TRANSMISSION LINES AND WAVEGUIDES

Time : Three Hours **Maximum : 100 Marks**

Answer ALL Questions

Part A – (10 × 2 = 20 Marks)

1. Write any two advantages of m-derived filters over constant K-filters.
2. Determine the value of L required by a constant K T-section high pass filter with a cutoff frequency of 1.5 KHz and design impedance of 500 Ω.
3. A transmission line has a characteristic impedance of 600 om .Determine magnitude of reflection of coefficient if the receiving and impedance is (650-j 475) ohm.
4. Define distortion loss.
5. Give the equations for the characteristic impedance and propagation constant of a dissipation-less line.
6. Mention the disadvantages of single stub matching.
7. A wave is propagated in the dominant mode in a parallel plane wave-guide. The frequency is 6 GHz and the plane separation is 4 cm .Calculate the cutoff wavelength and the wavelength in the wave-guide.
8. Give the equations for the propagation constant and wavelength for TEM waves between parallel planes.
9. What are the advantages and application of cylindrical wave-guides?
10. Mention the different types of guide termination.

Part B – (5 × 16 = 80 Marks)

11. a) i) Draw and explain the design and operation of m-derived T-section bandpass filter with necessary equations and diagrams.

ii) Design constant K bandstop filters (both T and sections) for the cutoff frequencies of 2 KHz and 6 KHz .The design impedance is 500 Hz.

(OR)

b) i) Explain the principle and operation of crystal filters with neat diagrams.

ii) Design an m derived low pass filter with a cutoff frequency of 2 KHz .Design impedance is 500 ohm and m=0.4.Consider a π section for your calculation.

12. a) i) What are the types of waveform distortion introduced by a transmission line ? Derive the conditions for the distortion less operation of a transmission line.

ii) The constants of a transmission line are R=6 ohm/Km, L=2.2 mH/Km. C=0.005 μF/Km and G=0.25×10^{-3} mhos/Km. Calculate the attenuation constant and phase constant at 1000 Hz.

OR

b) i) Derive the transmission line equations and obtain expressions for the voltage and current on a transmission line.

ii) A transmission line has a characteristic impedance of (683-j138)Ohm. The propagation constant is ((0.0074+j0.0356)per Km.Determine the values of R and L of this line if the frequency is 1000Hz.

13. a) i) Derive an expression for the input impedance of a dissipation-less line. Extend your results for open and short circuited lines also.

ii) Write a brief note on impedance measurement on transmission lines.

(OR)

b) i) Discuss the principle of double stub matching with neat diagram and expressions.

ii) A single stub is to match a 300 ohm line to a load of (180+j120) Ω. The wavelength is 2 meters. Determine the shortest distance from the load to the stub location and proper length of a short circuited stub using relevant formula.

14. a) Discuss the transmission of TM waves between parallel perfectly conducting planes with necessary expressions for the field components . Discuss the characteristics of TE and TM waves between the parallel planes.

(OR)

b) i) Disuss briefly he attenuation of TE and TM waves between parallel planes.

ii) Describe the manner of wave travel between parallel planes with necessary expressions for their velocities.

15. a) i) Describe the propagation of TE waves in a rectangular waveguide with a necessary expressions for the field components. (10)

ii) An air filled rectangular waveguide of dimensions a=6 cm and b=4 cm operates in the TM_{11} mode. Find the cutoff frequency guide wavelength and phase velocity at a frequency of 3 GHz.

(OR)

b) i) Describe the principle and operation of rectangular cavity resonators with relevant expressions.

ii) Give a brief note on excitation of modes in rectangular waveguides.
