Reg. No. : ⃞⃞⃞⃞⃞⃞⃞⃞⃞⃞⃞

Question Paper Code : 53126

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2010

Fifth Semester

Electronics and Communication Engineering

EC 2305 — TRANSMISSION LINES AND WAVEGUIDES

(Regulation 2008)

Time : Three hours   Maximum : 100 Marks

Answer ALL questions

PART A — (10 × 2 = 20 Marks)

1. A constant-K T-section high pass filter has a cutoff frequency of 10 KHz. The design impedance is 600 ohms. Determine the value of L.

2. What are the advantages of m-derived filters?

3. Define delay distortion.

4. Write the expressions for the phase constant and velocity of propagation for telephone cable.

5. A lossless line has a characteristic impedance of 400 ohms. Determine the standing wave ratio if the receiving end impedance is 800 +j 0.0 ohms.

6. Write the expressions for the input impedance of open and short circuited dissipationless line.

7. Define the cutoff frequency for the guided waves.

8. For a frequency of 6 GHz and plane separation of 3 cm, find the group and phase velocities for the dominant mode.

9. Calculate the cutoff wavelength for the TM_{11} mode in a standard rectangular waveguide if a = 4.5 cm.

10. Give the applications of cavity resonators.

PART B — (5 × 16 = 80 Marks)

11. (a) (i) Design a m-derived T-section low pass filter having a cutoff frequency (f_c) of 5000 Hz and a design impedance of 600 ohms. The frequency of infinite attenuation is 1.25 f_c.   (8)

      (ii) Draw and explain the operation of crystal filters.   (8)

Or

  (b) (i) Design a constant-K T-section bandpass filter with cutoff frequencies of 1 KHz and 4 KHz. The design impedance is 600 ohms.   (8)

      (ii) Draw a constant-K T-section band elimination filter and explain the operation with necessary design equations.   (8)

12. (a) (i) A transmission line has the following per unit length parameters : L = 0.1 μH, R = 5 ohms, C = 300 pF and G = 0.01 mho. Calculate the propagation constant and characteristic impedance at 500 MHz. (8)

      (ii) Derive the conditions required for a distortionless line.   (8)

Or

  (b) (i) The characteristic impedance of a uniform transmission line is 2309.6 ohms at a frequency of 800 MHz. At this frequency, the propagation constant is 0.054(0.0366 + j 0.99). Determine R and L.   (6)

      (ii) Explain the reflection on lines not terminated in characteristic impedance with phasor diagrams. Define reflection coefficient and reflection loss.   (10)

13. (a) (i) Draw and explain the operation of quarter wave line.   (8)

      (ii) It is required to match a 200 ohms load to a 300 ohms transmission line to reduce the SWR along the line to 1. What must be the characteristic impedance of the quarter wave transformer used for this purpose if it is directly connected to the load?   (4)

      (iii) What are the drawbacks of single stub matching and open circuited stubs?   (4)

Or

  (b) (i) Draw and explain the principle of double stub matching.   (8)

      (ii) A UHF lossless transmission line working at 1 GHz is connected to an unmatched line producing a voltage reflection coefficient of 0.5(0.866 + j 0.5). Calculate the length and position of the stub to match the line.   (8)

14. (a) (i) Explain the transmission of TE waves between parallel perfectly conducting planes with necessary expressions and diagrams for the field components. (12)

(ii) A TEM wave at 1 MHz propagates in the region between conducting planes which is filled with dielectric material of $\mu_r = 1$ and $\varepsilon_r = 2$. Find the phase constant and characteristic wave impedance. (4)

Or

(b) (i) Explain the reasons for the attenuation of TE and TM waves between parallel planes with necessary expressions and diagrams. (10)

(ii) Write a brief note on the manner of wave travel and their velocities between parallel planes. (6)

15. (a) (i) Discuss the propagation of TM waves in a rectangular waveguide with relevant expressions and diagrams for the field components. (10)

(ii) A rectangular waveguide measuring a = 4.5 cm and b = 3 cm internally has a 9 GHz signal propagated in it. Calculate the guide wavelength, phase and group velocities and characteristic impedance for the dominant mode. (6)

Or

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

_____