Reg. No. : | | | | | | | | | | | |

Question Paper Code : P 1261

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Fifth Semester

Electronics and Communication Engineering

EC 1305 — TRANSMISSION LINES AND WAVEGUIDES

(Regulation 2004)

(Common to B.E. (Part-Time) Fourth Semester – ECE – Regulation 2005)

Time : Three hours Maximum : 100 marks

(Smith chart is to be provided)

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define phase distortion.

2. What is meant by inductance loading of telephone cables?

3. A low loss line has a characteristic impedance of 400 ohms. Determine the standing wave ratio if the receiving end impedance is (650 – j475) ohms.

4. Give the applications of an eighth wave line.

5. Write the expressions for the wave impedance of TE and TM waves between parallel planes.

6. Give the expressions for the cutoff wavelength and propagation constant of TE waves between parallel planes.

7. A rectangular air filled copper waveguide with dimensions of a = 2.28 cm and b = 1.01 cm has a 9.2 GHz signal propagated in it. Determine the guide wavelength for TE_{10} mode.

8. A waveguide has an internal breadth 'a' of 3 cm and carries the dominant mode of a signal of unknown wavelength. If the characteristic wave impedance is 500 ohms, calculate the signal wavelength.

9. What are the disadvantages of circular waveguides?

10. Define a cavity resonator and also give its application.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive expressions for the attenuation and phase constants of a transmission line in terms of the line constants R, L, G and C. (10)

(ii) The constants of a transmission line are R = 6 ohms/km, L = 2.2 mH/km, C = 0.005×10^{-6} F/km and G = 0.25×10^{-6} mbos/km. Determine the characteristic impedance and propagation constant at 1000 Hz. (6)

Or

(b) (i) Derive an expression for the input impedance of a transmission line. Hence obtain the input impedance for a lossless line. (8)

(ii) Write a short note on reflection factor and reflection loss. (8)

12. (a) (i) Discuss the operation of a quarter wave line and illustrate its applications. (8)

(ii) A lossless line in air having a characteristic impedance of 300 ohms is terminated by unknown impedance. The first voltage minimum is located at 15 cm from the load. The standing wave ratio is 3.3. Calculate the wavelength and terminating impedance. (8)

Or

(b) (i) A load having an impedance of (450 – j 600) ohms at 10 MHz is connected to a 300 ohms line. Calculate the position and length of a short circuited stub to match this load to the line using Smith chart. (12)

(ii) What are the drawbacks of single stub matching? Briefly discuss how it is overcome by double stub matching. (4)

13. (a) Discuss the transmission of TM waves between parallel perfectly conducting planes with necessary expressions for the field components. (16)

Or

(b) Discuss the attenuation of TE and TM waves between parallel planes with necessary expressions and diagram. (16)

14. (a) Describe the field components of TE waves in a rectangular waveguide with necessary expressions and also plot the field configurations for the TE_{10} mode. (16)

Or

(b) (i) 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 wave impedance for TM_{11} mode. (10)

(ii) Write a brief note on excitation of modes in rectangular waveguides. (6)

15. (a) Discuss the propagation of TM waves in a circular waveguide with relevant expression for the field components (16)

Or

(b) (i) Explain the field components of the TE waves in a rectangular cavity resonator with relevant expressions. (10)

(ii) Calculate the cutoff wavelength, guide wavelength and characteristic wave impedance of a circular waveguide with an internal diameter of 4 cm for a 10 GHz signal propagated in it in the TE_{11} mode. (6)
