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

Question Paper Code : 41264

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Fifth Semester

Electronics and Communication Engineering

080290031 — TRANSMISSION LINES AND WAVEGUIDES

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a Flat line? Mention its characteristics.

2. Define group velocity. Write its relation to phase velocity.

3. Mention the potential applications of $\lambda/2$ and $\lambda/8$ lines.

4. What is the difference between single stub tuner and double stub tuner?

5. Enumerate the characteristics of TE waves.

6. When a wave of 6 GHz propagates in parallel conducting plates separated by 3cm, find the v_p and v_g of the wave for the dominant wave.

7. A 10 GHz wave is propagating in a waveguide having a wall separation of 4 cm. What is the largest number of half waves of electric intensity, possible in this waveguide?

8. Which mode does not exist in waveguides? Why?

9. Which mode offers widest tuning range in cylindrical cavity resonators? Why?

10. List the salient features of circular waveguides.

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the different types of transmission lines? Briefly comment on them. (8)

(ii) Derive the Telegraphic equations of transmission lines. (8)

Or

(b) (i) Define and explain

(1) Characteristic impedance

(2) Transfer impedance

(3) Propagation constant

(4) Reflection coefficient. (8)

(ii) Derive the input impedance of a lossless line. For a shorted section of 75 ohm transmission line $l = \lambda/4$, find the input impedance assuming $\alpha = 0$. (8)

12. (a) (i) Explain the characteristics of SMITH chart. (6)

(ii) Derive the Smith chart equations. (10)

Or

(b) (i) Derive the input impedance for a loss less quarter wave transformer terminated by an impedance Z_L. (8)

(ii) Explain the principles of impedance matching using Single stub tuner with a neat diagram. (8)

13. (a) (i) Explain the characteristics of TEM waves. Derive its propagation parameters. (10)

(ii) When a wave of 5 GHz is to be propagated between two parallel conducting plates separated by 50 mm, find the modes that will propagate through the guide. (6)

Or

(b) (i) Explain the characteristics of TM waves. Derive the filed components of TM waves. (10)

(ii) Give an account of "Characteristics of Uniform plane waves". (6)

14. (a) (i) Derive the field equations for TE waves in rectangular hollow waveguides. (10)

(ii) Discuss the different methods of excitation of modes in rectangular waveguides. (6)

Or

(b) (i) Define and explain

(1) Evanescent Mode

(2) Cutoff wavelength

(3) Surface impedance

(4) Skin depth. (8)

(ii) Design a rectangular waveguide (determine dimensions a and b), so that the cutoff frequency for the TE_{10} mode is 14 GHz and the cutoff frequency for the TM_{11} mode is 30 GHz. (8)

15. (a) (i) Explain the significance of Bessel functions in circular waveguide mode with an example. (6)

(ii) Mathematically prove that the dominant mode for circular waveguide is TE_{11}. (10)

Or

(b) (i) Design a rectangular cavity to have a resonant frequency of 10GHz, having dimensions a=d and b=a/2. (8)

(ii) Write technical notes on :

(1) Q factor of cavity resonator

(2) Semicircular cavity resonator. (8)