Question Paper Code : 55341

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2011.

Fifth Semester

Electronics and Communication Engineering

EC 2305 — TRANSMISSION LINES AND WAVE GUIDES

(Regulation 2008)

(Common to PTEC 2305 — Transmission lines and Wave guides for B.E. (Part-Time) Fourth Semester — Electronics and Communication Engineering Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the significance of propagation constant in symmetrical network?

2. Draw the equivalent electrical circuit for a piezoelectric crystal.

3. When does a finite line appear as an infinite line?

4. If a line is to have neither frequency nor delay distortion, how do you relate attenuation constant and velocity of propagation to frequency?

5. For the line of zero dissipation, what will be the values of attenuation constant and characteristic impedance?

6. Define standing wave ratio.

7. Write down the relationship between phase velocity and group velocity.

8. Write down the equations for characteristic impedance for TM, and TM waves.

9. A rectangular waveguide of cross section 5 cm × 2 cm is used to propagate TM_{11} mode at 10 GHZ. Determine the cut-off wave length.

10. What is the need for guide termination?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive the equations for the characteristic impedance of symmetrical T and π networks. (8)

(ii) Discuss the properties of symmetrical network in terms of characteristic impedance and propagation constant. (8)

Or

(b) With suitable filter sections, design constant-K low pass and high pass filters. (16)

12. (a) (i) If $Z = R + j\omega L$ and $Y = G + j\omega C$, show that the line parameter values fix the velocity of propagation for an ideal line. (8)

(ii) Deduce the expressions for characteristic impedance and propagation constant of a line of cascaded identical and symmetrical T sections of impedance. (8)

Or

(b) Derive the two useful forms of equations for voltage and current at any point on a transmission line. (16)

13. (a) (i) Derive the expression that permit easy measurements of power flow on a line of negligible losses. (10)

(ii) Derive the expressions for input impedance of open and short circuited lines. (6)

Or

(b) Discuss the various parameters of open-wire and co-axial lines at radio frequency. (16)

14. (a) (i) Derive the equations that are the result of introduction of restrictions on time to Maxwell's equations. (8)

(ii) Derive the field equations for TE waves between parallel planes. (8)

Or

(b) Explain TEM and TM cases for attenuation with planes of finite conductivity. (16)

15. (a) A rectangular air-filled copper waveguide with dimension 0 9 inch × 0.4 inch cross section and 12 inch length is operated at 9.2 GHZ

with a dominant mode. Find cut-off frequency, guide wave-length, phase velocity, characteristics impedance and the loss. (16)

Or

(b) (i) Find the resonant frequencies of first five lowest modes of an air-filled rectangular cavity of dimensions 5 cm ×4 cm × 2.5 cm. List them in ascending order. (8

(ii) An air-filled circular waveguide having an inner radius of 1 cm is excited in dominant mode at 10 Ghz. Find cut-off frequency of dominant mode, guide wavelength, wave impedance and the bandwidth for operation in dominant mode only. (Given $[X'_{11} = 1.84; X_{01} = 2.40]$. (8)