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

Question Paper Code : 71456

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Fifth Semester

Electronics and Communication Engineering

EC 2305/EC 55/10144 EC 504 — TRANSMISSION LINES AND WAVEGUIDES

(Regulation 2008/2010)

(Common to PTEC 2305 – Transmission Lines and Waveguides for B.E. (Part-Time) Fourth Semester Electronics and Communication Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

(Smith chart is to be provided)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the disadvantages of constant–K filter?

2. Draw the equivalent circuit for a piezoelectric crystal.

3. What is the drawback of using ordinary telephone cables?

4. Define the term insertion loss.

5. How will you make standing wave measurements on coaxial line?

6. List the applications of the smith chart.

7. Define the terms phase velocity and group velocity.

8. What are the characteristics of TEM wave?

9. A rectangular waveguide has the following dimensions $l = 2.54$ cm, $b = 1.27$ cm and thickness = 0.127 cm. Calculate the cut-off frequency for TE_{11} mode.

10. What are the dominant mode and degenerate modes in rectangular waveguide?

PART B — (5 × 16 = 80 marks)

11. (a) Derive and draw the m-derived T and Π section for low pass and high pass filter. (16)

Or

(b) Derive characteristic impedance, inductance, capacitance and cut-off frequency for constant k low pass and constant k highpass filter, also draw their reactance curves. (16)

12. (a) (i) Obtain the general solution of transmission line. (10)

(ii) A telephone cable 64 km long has a resistance of 13 Ω/km and a capacitance of 0.008 μF/km. Calculate attenuation constant, velocity and wavelength of the line at 1000 Hz. (6)

Or

(b) (i) Explain about different type of transmission line. (8)

(ii) Discuss the following : reflection loss and return loss. (8)

13. (a) (i) Derive the expression for the input impedance of the dissipationless line and thus obtain the expression for the input impedance of the quarter wave line. Also discuss the applications of the quarter wave line. (10)

(ii) Design a single stub match for a load of 150 + j 225 ohms for a 75 ohms line a 500 MHz using smith chart. (6)

Or

(b) Explain double stub matching on a transmission line and derive the expression and the length of the stub used for matching on a line. (16)

14. (a) Discuss the characteristics of TE and TM waves and also derive the cut off frequency and phase velocity from the propagation constant. (16)

Or

(b) (i) Derive field component of the wave propagation between parallel plates. (8)

(ii) Derive the expression of wave impedance of TE, TM and TEM wave between a pair of perfectly conducting planes. (8)

15. (a) (i) Explain about excitation modes in rectangular wave-guide. (10)

(ii) Calculate resonant frequency of an air filled rectangular resonator of dimensions $a = 3$ cm, $b = 2$ cm and $d = 4$ cm operating in TE_{101} mode. (6)

Or

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

———————