Question Paper Code : 10301

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

Fifth Semester

Electronics and Communication Engineering

EC 2305/EC 55 — TRANSMISSION LINES AND WAVEGUIDES

(Regulation 2008)

(Common to PTEC 2305 – Transmission lines and waveguides 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. Write the relationships betwen neper and decibel.

2. Write the disadvantages of constant - K filter.

3. Draw the equivalent circuit of a unit length of a transmission line.

4. What is meant by infinite line?

5. Write the disadvantages of single stub matching.

6. Write the relationship between SWR and reflection coefficient.

7. Write the Maxwell's equations.

8. What is meant by dominant mode? What is the dominant mode for parallel plate wave guides?

9. Write the expression for the wave impedance and guide wavelength for TEM mode.

10. Which is the dominant mode of a rectangular waveguide? Why?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Calculate the values of the inductor and capacitors of a prototype constant-K low pass filter composed of π section to operate with a terminating load of 600 ohms and to have a cut off frequency of 3 KHz. (6)

    (ii) Construct a band stop constant-K filter. (10)

Or

    (b) (i) Discuss the characteristics of symmetrical network. (6)

    (ii) Design an m-derived T-section low pass filter having cut off frequency $f_c = 1000 Hz$, design impedance $R_K = 600$ ohms and frequency of infinite attenuation $f_\infty = 1050$ Hz. (10)

12. (a) (i) Derive the general solutions of a transmission line terminated with any load impedance Z_R. (8)

    (ii) A transmission line has the following constants R = 10.4 Ω, L = 3.666 mH, C = 0.00835 μF and G = 0.08 $\mu mhos$. Calculate its characteristic impedance, attenuation and phase constant and phase velocity. (8)

Or

    (b) (i) A low loss transmission line of 100 ohms characteristic impedance is connected to a load of 200 ohm. Calculate the voltage reflection co-efficient and the standing wave ratio. (6)

    (ii) Discuss the theory of open and short circuited lines with voltage and current distribution diagrams and also get the input impedance expression. (10)

13. (a) (i) An ideal loss less quarter wave transmission line of characteristic impedance 60 Ω is terminated in a load impedance Z_L. Give the value of the input impedance of the line when $Z_L = 0$, ∞ and 60 Ω. (6)

    (ii) Write the concepts of single and double stub matching. (10)

Or

    (b) (i) A 100 Ω, 200 m long lossless transmission line operators at 10 MHz and is terminated into an impedance of 50 -j 200 Ω. The transit time of the line is 1 μs. Determine the length and location of a short circuited stub line. (8)

    (ii) Write the concepts of Quarter wave length line and half wave length line. (8)

14. (a) (i) Discuss the transmission of TM waves between parallel planes. (8)

(ii) Write the instantaneous field expressions for TM_1 mode in a parallel plate waveguide. (8)

Or

(b) (i) Discuss the transmission of TE waves between parallel planes. (8)

(ii) Sketch the field lines of TE_1 mode in parallel plate waveguides. (8)

15. (a) (i) Discuss the characteristics of TM waves in circular wave guides. (10)

(ii) A 10 GHz signal is to be transmitted inside a hollow circular conducting pipe. Determine the inside diameter of the pipe such that its lowest cut off frequency is 20 % below this signal frequency. (6)

Or

(b) (i) Discuss the principle of rectangular cavity resonator. (8)

(ii) Determine the dominant modes and their frequencies is an air filled rectangular cavity resonator for

(1) $a > b > d$

(2) $a > d > b$ and

(3) $a = b = d$ where a, b and d are the dimensions is the x, y and z directions, respectively. (8)

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