A 244

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2004.

Fifth Semester

Electronics and Communication Engineering

EC 335 — TRANSMISSION LINES AND NETWORKS

Time : Three hours Maximum : 100 marks

Smith chart can be provided.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is group velocity?

2. What is patch loading?

3. Derive the relationship between standing wave ratio and reflection coefficient.

4. Define node and antinode.

5. What are constant S circles?

6. What are the advantages of double stub matching over single stub matching?

7. Why constant K filters are also known as prototype filters?

8. Define cut-off frequency.

9. What is a pad?

10. What are the functions of an equaliser?

PART B — (5 × 16 = 80 marks)

11. (i) Design a band pass filter to operate into input and output resistance of 100 Ω and have a pass band between 4.8 KHz and 5.2 KHz. (8)

(ii) In a constant-K band pass filter, the ratio of the shunt arm capacitance to the total series arm capacitance is 100 : 1. The frequency of resonance of both the arm is 1000 Hz. Calculate the B.W. of the filter. (8)

12. (a) (i) Derive the equations of attenuation constant and phase constant of a transmission line in terms of R, L, C and G. (8)

(ii) Develop the differential equations governing the voltage and current at any point on a uniform transmission line solve these to obtain the voltage and current in terms of the load current and voltage. (8)

Or

(b) A generator of 1 V, 1 KHz supplies power to a 100 km open wire terminated in 200 Ω resistance. The line parameters are $R = 10$ Ω/km, $L = 3.8$ mH/km, $G = 1 \times 10^{-6}$ mho/km, $C = 0.0085$ μ F/km. Calculate the input impedance, reflection coefficient, the input power, o/p power and transmission efficiency. (16)

13. (a) (i) Derive the input impedance expression for a lossless terminated line in (1) short circuit case (2) open circuit case. (8)

(ii) Explain the method of power and impedance measurement on the line. (8)

Or

(b) (i) Write a note on measurement using network analyser. (8)

(ii) Discuss how short circuited and open circuited lines can be used as circuit elements at high frequencies. (8)

14. (a) For a load of $\frac{Z_R}{Z_0} = 0.8 + j1.2$ design a double stub tuner making the distance between the stubs $\frac{3\lambda}{8}$. Specify the stub length and distance from the load to first stub. The stubs are short-circuited. Verify using Smith chart. (16)

Or

(b) (i) Write a note on quarter wave transformer. (8)

(ii) Write applications of quarter wave line. (8)

15. (a) Design a full shunt equaliser with capacitor in series arm for design impedance of 600 Ω and attenuation of 10 db at 600 Hz. Calculate attenuation at 1500 Hz and 3000 Hz. (13)

Or

(b) (i) Explain the theory of inverse networks. (5)

(ii) Derive the design equations of a asymmetrical T type attenuator. (8)