Reg. No. :

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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Fifth Semester

Electronics and Communication Engineering

EC 1303 – TRANSMISSION LINES AND WAVEGUIDES

(Regulation 2008)

Time : Three hours Maximum : 100 marks

(smith chart is to be provided)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write down the primary constants and secondary constants for the line of zero dissipation.

2. Define Phase distortion.

3. What is the value of Z_0 for the dissipation less line?

4. A low loss line has a characteristic impedance of 400 ohms. Determine the standing Wave ratio if the receiving end impedance is (650-j475) ohms.

5. Write the expressions for the wave impedance of TE and TM waves between Parallel planes.

6. Give the expressions for the cutoff wavelength and propagation constant of TE Waves between parallel planes.

7. A rectangular air filled copper wave guide with dimensions of a = 2.28 cm and b = 1.01 cm has a 9.2 GHz signal propagated in it. Determine the guide wave length for TE_{10} mode.

8. A waveguide has an internal breadth a of 3 cm and carries the dominant mode of a signal of unknown wavelength. If the characteristic wave impedance is 500 ohms, Calculate the signal wavelength.

9. What are the disadvantages of circular waveguides?

10. Define a cavity resonator and also give its application.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive expressions for the attenuation and phase constants of a transmission line in terms of the line constants R, L, G and C. (10)

(ii) The constants of a transmission line are $R=6$ ohms/km, $L=2.2$ mH/km, $C=0.005\times10^{-6}$F/km and $G=0.25\times10^{-6}$mhos/km. Determine the characteristic Impedance and propagation constant at 1000 Hz. (6)

Or

(b) (i) Derive an expression for the input impedance of a transmission line. Hence Obtain the input impedance for a lossless line (8)

(ii) Write a short note on reflection factor and reflection losss. (8)

12. (a) (i) Define standing wave ratio and obtain the expression of VSWR in terms of Reflection coefficient. (8)

(ii) Derive the input impedance of a quarter wave line and discuss its applications. (8)

Or

(b) (i) Explain the procedure of double stub matching on a transmission line with an Example. (8)

(ii) Determine the length and location of a single short circuited stub to produce an impedance match on a transmission line with R_0 of 600 ohm and terminated in 1800 ohms. (8)

13. (a) (i) Derive the expressions for the field components of TM waves between parallel Plates ,propagating in Z direction. (10)

(ii) For a frequency of 6 GHz and plane separation = 7cm. Find the following for the TE_{10} mode :

(1) Cut off Frequency

(2) Phase and Group velocity. (6)

Or

(b) Explain wave impedance and obtain the expressions of wave impedance for TE and TM waves guided along Parallel planes. Also sketch the variation Of wave impedance with frequency.

14. (a) Describe the field components of TE wave in a rectangular wave guide with Necessary expressions and also plot the field configurations for the TE_{10} mode. (16)

Or

(b) (i) A rectangular wave guide measuring a = 4.5 cm and b = 3 cm internally has a 9 GHz signal propagated in it. Calculate the wave length phase and Group velocities and characteristic wave impedance for TM_{11} model. (10)

(ii) Write a brief note on excitation of modes in rectangular waveguides. (6)

15. (a) Derive the expression for the field components of TE waves guided along circular Wave guide. (16)

Or

(b) (i) Define unloaded ,loaded and external Q of rectangular cavity resonator And show how they are related. (4)

(ii) Find an expression of unloaded Q of a rectangular cavity $(a\times b\times a)$, $a>b$ excited in dominant TE_{101} mode. (12)