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Question Paper Code : 80344

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fifth Semester

Electronics and Communication Engineering

EC 6503 — TRANSMISSION LINES AND WAVE GUIDES

(Regulations 2013)

Time : Three hours Maximum : 100 marks

(Normalized Smith chart is to be provided)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by distortionless line?

2. Find the Characteristic impedance of a line at 1600 HZ if $Z_{oc} = 750\angle -30^\circ \Omega$ and $Z_{sc} = 600\angle -20^\circ \Omega$.

3. Write the expression for the input impedance of open and short circuited dissipationless line.

4. Calculate Standing Wave Ratio and Reflection Coefficient on a line having the characteristic impedance $Z_0 = 300\Omega$ and terminating impedance in $Z_R = 300 + j400\Omega$.

5. Distinguish between Single Stub and Double Stub matching in a transmission line.

6. Give the application of eight wave line.

7. A constant-K, T-section high pass filter has a cut off frequency of 10 KH and the design impedance is 600 Ω. Determine the value of shunt inductance L and series Capacitance C.

8. Define propagation constant in a symmetrical network.

9. Justify, why TM_{01} and TM_{10} modes in a rectangular waveguide do not exit.

10. An air-filled rectangular waveguide of inner dimensions 2.286 × 1.016 in centimeters operates in the dominant TE_{10} modes. Calculate the cut-off frequency and phase velocity of a wave in the guide at a frequency of 7 GHz.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain in detail about the reflection on a line not terminated by its characteristic impedance Z_0. (8)

(ii) Derive the condition for minimum attenuation in a distortionless line. (8)

Or

(b) A Communication line has L = 3.67 mH/km, G = 0.08×10^{-6} mhos/km, C = 0.0083 μF/km and R = 10.4 ohms/km. Determine the characteristic impedance, propagation constant, phase constant, velocity of propagation, sending end current and receiving end current for given frequency f = 1000 HZ, Sending end voltage is 1 volt and transmission line length is 100 kilometers. (16)

12. (a) (i) Derive an expression for the input impedance of a dissipationless line and also find the input impedance is maximum and minimum at a distance 's'. (8)

(ii) Find the sending end line impedance for a HF line having characteristic impedance of 50 Ω. The line is of length (1.185 λ) and is terminated in a load of (110 + j80) Ω. (8)

Or

(b) (i) Describe an experimental set up for the determination of VSWR of an RF transmission. (8)

(ii) Briefly explain on :

(1) Standing Waves

(2) Reflection loss. (4 + 4)

13. (a) (i) Determine length and location of a single short circuited stub to produce an impedance match on a transmission line with characteristic impedance of 600 Ω and terminated in 1800 Ω. (8)

(ii) Explain the operation of quarter wave transformer and mention it's important applications. (8)

Or

(b) (i) Find the sending end impedance of a line with negligible losses when characteristic impedance is 55 Ω and the load impedance is 115 + j75 Ω length of the line is 1.183 wave length by using smith chart . (10)

(ii) Explain the significance of smith chart and its application in a transmission lines. (6)

14. (a) What is m-Derived filter? Draw a m-Derived T-section and π -section low pass filter and explain the analysis of m-Derived low pass filter with respect to attenuation, phase shift and characteristic impedance with frequency profile respectively. (16)

Or

(b) What is composite filter? Design a constant-K-low pass filter (T-section and π -section) and having cut-off at which 2.5 KHz and design resistance R_0 is 700 Ω. Also find the frequency at which this filter produces attenuation of 19.1 dB. Find its characteristic impedances and phase constant at pass band and stop or attenuation band. (2 + 14)

15. (a) Derive an expression for the transmission of TE waves between parallel perfectly conducting planes for the field components. (16)

Or

(b) (i) Write a brief note on circular cavity resonator and its application.(8)

(ii) A TE_{11} wave is propagating through a circular waveguide. The diameter of the guide is 10 cm and the guide is air-filled. Given $X_{11} = 1.842$.

(1) Find the cut-off frequency. (3)

(2) Find the wavelength λ_g in the guide for a frequency of 3 GHz. (2)

(3) Determine the wave impedance in the guide. (3)
