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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 $\mu$F/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 $\lambda$) 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 $\pi$-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 $\pi$-section) and having cut-off at which 2.5 KHz and design resistance $R_0$ is 700 $\Omega$. 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 $\lambda_g$ in the guide for a frequency of 3 GHz. (2)

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

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