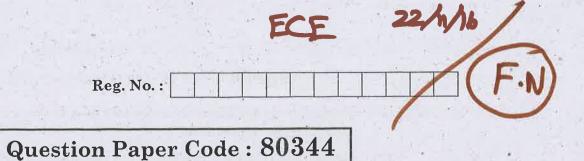
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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

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 — $(10 \times 2 = 20 \text{ marks})$

- 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 TM₀₁ and TM₁₀ 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 — $(5 \times 16 = 80 \text{ márks})$

- 11. (a) (i) Explain in detail about the reflection on a line not terminated by its characteristic impedance Z₀. (8)
 - (ii) Derive the condition for minimum attenuation in a distortionless line.

Or

- (b) A Communication line has L=3.67 mH/km, $G=0.08\times 10^{-6}$ mhos/km, C=0.0083 μ 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'.
 - (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 $55~\Omega$ and the load impedance is $115+j75~\Omega$ 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 R₀ 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 TE₁₁ 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)