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B.E / B.Tech (Part-Time) DEGREE EXAMINATIONS, NOV / DEC 2013

ELECTRONICS AND COMMUNICATION ENGINEERING BRANCH

FOURTH Semester

PTEC 284 / PTEC 9305 – TRANSMISSION LINES AND WAVE GUIDES

(Regulation 2005 / 2009)

Time : 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10X2=20 Marks)

1. What is loading of a transmission line? Compare the variation of attenuation of a loaded and unloaded transmission line with frequency?
2. A transmission line of characteristic impedance 50 Ω is connected to a load Z_L = 30 + j40 Ω. If the length of the line is 0.725 λ, compute the reflection coefficient at the load if the line is assumed lossless.
3. Give the significance of λ/4 and λ/8 lines?
4. Sketch the impedance variation and VSWR pattern along a transmission line terminated in short circuit indicating the type of impedance (lumped equivalent) along the length of the line from load to source.
5. Bring out the ideal filter characteristics.
6. State the concept of constant resistance equalizer?
7. What is mode excitation in rectangular waveguides?
8. What are dominant mode and degenerate mode?
9. What is the significance of Bessel function in circular waveguide analysis?
10. What is cavity resonator? Mention its application.

PART-B (5X16=80 Marks)

11.(i) Derive the differential equation that govern the variation of voltage and current along the length of a transmission line and obtain the solution of it. (Give the solution in exponential form). **(12)**

(ii) Give the physical significance of these equations. **(4)**

12.(a)(i) Why we use short circuited shunt stub connection in stub matching? **(4)**

(ii) For a load impedance of the line is 300+j500Ω, Z_0 = 50 Ω. Design a single stub matching? Stubs are SC. (Use Smith chart). **(12)**

OR

12.(b) Consider a line with negligible losses with Z_0 = 55 Ω and Z_R = 115 + j75 Ω. The length of the line is 1.183 λ. Using Smith chart determine, (i) SWR ; (ii) Load admittance ; (iii) Input impedance; (iv) Reflection coefficient ; and (v) Distance of first voltage minima from the load.

13.(a)(i) Derive the expression that will help you to predict the filter performance and hence derive the design equations for constant k low pass filter. **(10)**

(ii) Draw the variation of attenuation and phase with respect to frequency for a low pass section. **(6)**

OR

13.(b)(i) Design a constant k low pass filter composed of (Both T and π section)to operate with a terminating load of 600 Ω and to have a cut off frequency of 3 KHz. **(8)**

(ii) Obtain the design equations of a Lattice attenuator with neat sketch. **(8)**

14.(a)(i) Starting from Maxwell's equation obtain the expression for various components of Electric and magnetic field strengths assuming propagation in z direction in parallel planes. **(10)**

(ii) Sketch the electric and magnetic fields between parallel planes for TE_{10} TM_{10} waves. **(6)**

OR

14.(b)(i) What modes are propagated at frequencies below 3.75 GHz for a square waveguide 100 mm on a side? **(8)**

(ii) A x-band waveguide with dimensions 2.286 x 1.016 cm has a cut off frequency of 6.56 GHz for the dominant mode. Calculate the phase and group velocities at 8, 10 and 12 GHz. **(8)**

15.(a) Derive the field components for TM waves in cylindrical waveguides. **(16)**

OR

15.(b)(i) A rectangular cavity resonator has dimensions of a = 5 cm, b = 2 cm and d = 15 cm. Compute, (1) the resonant frequency of the dominant mode for an air filled cavity. (2) the resonant frequency of the dominant mode for a dielectric filled cavity of $\varepsilon_r = 2.56$. **(8)**

(ii) Explain in detail the formation, excitation and working of cavity resonators. Draw the equivalent circuit of a resonator. **(8)**
