Roll No:----------

B.E Degree Examination, Anna University,Nov/Dec 2012

EC 9305 Transmission Lines and waveguides

V Semester, Electronics and Communication Engineering

(Use of Smith Chart permitted)

Smith chart must be provided

Duration: 3 Hours **Max Marks: 100**

Answer All Questions

Part A (10X2=20 Marks)

1. Define "Characteristic impedance" of a transmission line?
2. What is the need for loading of transmission lines? Indicate the different methods of loading.
3. Sketch the input impedance variation long a transmission line when it is terminated with i)Short Circuit ii) Open Circuit
4. Give the applications of Smith Chart?
5. When are two networks said to be inverse to each other?
6. Why are constant K filters called by that name?
7. Can TEM wave Exist in a hollow rectangular waveguide? Give reasons for your answer
8. What do the suffix mn stand for in TE_{mn} and TM_{mn} in waveguide modes
9. Why is TM_{01} mode preferred to TE_{01} mode in circular waveguides for the same cutoff wavelength?
10. Define Quality factor Q of a resonator

Part B (5X16=80 Marks)

11. Derive the equation for voltage and current at any point on a transmission line and obtain its solution. Give the physical significance of these equations.

12.a)Design a double stub tuner for the following details. (Stubs are short circuited and distances are in wavelengths)Z_0=50 ohms working at 10 MHz

i)The distance between the load and first stub is 0.125λ

ii)The distance between the stubs is 0.125λ

iii)Terminating impedance Z_R =200+j100 ohms.

(OR)

12 b)When measurements were made on a transmission line the position of first voltage maximum was found at a distance of 0.125 λ from the load.The VSWR measured was 2. Determine the load impedance and design a single stub matching system for this line

13a)i)Derive the expression which predicts the filter performance. Discuss on it. **(8)**

ii)Design a constant K low pass filter having cutoff frequency 2000Hz and a characteristic impedance Ro=600 ohms.Also find the frequency at which the filter offers attenuation of 19.1 dB.Also calculate the phase shift in the passband at 1 KHz **(8)**

(OR)

13b)Derive the Design equations for a lattice equaliser and discuss the various applications of equalisers

14) a) Derive the expressions for the field components of TE waves between parallel planes starting from Maxwell equation.

(OR)

14) b) i) what modes are propagated at frequencies below 3.75 GHz for a square wave guide 100mm on a side? (8)

ii) *AnX*- band wave guide 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 expression for the field components inside the cylindrical waveguide.

(OR)

15) b) i) An air filled square cavity resonator, d mm on a side has a depth of d/3. For the T E_{110} mode ($T E_{lmn}$ mode where l=1,m=1 and n=0). L refers to the no. of half cycle variations in x direction(direction of propagation), m in z direction (large dimension of the wave guide) and n in the y direction(narrow dimension of the rectangular wave guide), at λ_0 =25 mm find (a) the dimension d for resonance, (b) Q if the 1/e depth of penetration in the cavity walls is 1.2 μm. (12)

ii) Describe the evanescent modes? . (4)