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B.E / BTech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APR / MAY 2013

ELECTRONICS AND COMMUNICATION ENGINEERING

33

FIFTH SEMESTER

EC 9305 – TRANSMISSION LINES AND WAVE GUIDES

(REGULATION – 2008)

Time: 3 hours **Max.Marks: 100**

Smith Chart to be provided

Answer ALL Questions

Part A – (10 x 2 = 20 Marks)

1. Differentiate between transmission line and an ordinary electrical network.
2. An air line has a characteristic impedance of 70 Ohms and a phase constant of 3 rad / m at 100 MHz. Calculate the inductance and capacitance per meter of the line .
3. What is the input impedance of an open circuited lossless transmission line if the length of the line is $\lambda/4$?
4. What is a smith chart and how it is useful in transmission line calculations.
5. What are the disadvantages of Constant K type filters?
6. Design a symmetrical "T "type attenuator with 20 dB attenuation and having source and load impedances as 200 Ohms and 800 Ohms respectively.
7. Calculate the Cutoff frequencies of TE_{02} mode in a waveguide of dimensions a = 2.5 cm , b = 1 cm.
8. How attenuation factor and Q are related in a wave guide?
9. Transmission lines are analogous to wave guides – Justify.
10. Define dominant mode in a cavity

Part – B (5 x 16 = 80 Marks)

11. (i) From the basic equations for TEM mode transmission line, derive the expressions for input impedance. (12)
    (ii) Deduce the expressions for input impedance in the case of open and short circuited lines. (4)

12.(a) (i) A transmission line of characteristic impedance 50 Ohms is terminated by a 100 Ohms resistor. What will be the VSWR in the line? Calculate the impedances at the voltage maximum and minimum position. (8)

(ii) Is the output reactance of a $\lambda/8$ transmission line, inductive or capacitive if it is (a) Open circuited (b) short circuited. Explain in detail. (8)

(OR)

(b) A load impedance $30 + j10$ Ohms is connected to a lossless transmission line of length 0.101λ and characteristic impedance 50 Ohms. Use a smith chart to find

(i) Standing wave ratio (5)

(ii) Voltage reflection coefficient (5)

(iii) Input impedance (6)

13(a). A low pass constant K filter with cut off frequency $f_c = 36$ kHz is required to produce a maximum attenuation of 60 KHz when used with 500 Ohms termination. Design a suitable "m" derived (i) T section (ii) Π section filters

(OR)

(b). Discuss briefly about various types of Equalisers.

14(a)(i) From the Maxwell's equations, derive the expressions for Electric and Magnetic field components inside a rectangular waveguide. (10)

(ii) Explain TE wave propagation in rectangular guides with necessary mathematical treatment. (6)

(OR)

(b)(i) Explain the excitation methods for various modes in a rectangular waveguide with relevant diagrams. (10)

(ii) TEM waves do not exist in wave guides – Explain in detail. (6)

15. (a) (i) Derive the solutions of Field equations in cylindrical waveguides. (10)

(ii) Discuss the TM wave solutions for a circular wave guide. (6)

(OR)

(b)(i) Deduce the expression for the resonance frequency in the case of rectangular cavity resonator. (12)

(ii)What should be the size of a hollow cubic cavity made of copper in order for it to have a dominant resonant frequency of 10 GHz . Also find the Q at that frequency. (4)