ANNA UNIVERSITY OF TECHNOLOGY, COIMBATORE

B.E. / B.TECH. DEGREE EXAMINATIONS : NOV / DEC 2010

REGULATIONS : 2008

FIFTH SEMESTER : ECE

080290031 - TRANSMISSION LINES AND WAVEGUIDES

TIME: 3 HOURS MAX. MARKS : 100

PART - A

(20 x 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1. What do you mean by lumped and distributed circuits?
2. Define phase and group velocities
3. What are the properties of infinite length?
4. Find the reflection coefficient of a 50Ω transmission line when it is terminated by a load impedance of 60+j40 Ω.
5. A lossless line has a shunt capacitance of 69 pF and a series inductance of 0.387μH, Calculate the characteristics impedance.
6. Write the value of SWR of the following loads. a)open circuit b)short circuit c)matched load
7. Determine the reflection coefficient of a line when Z_R =200 ohms and Z_0=692∠−12° ohms
8. Why standing waves do exists in transmission line?
9. A wave guide can be called as high pass filter. Why?
10. Define wave impedance
11. Define dominant mode. What is the dominant mode for parallel plate guide?
12. Define cutoff frequency. What is the cut off frequency of TEM wave in parallel plate wave-guide?
13. Why TEM wave is impossible in a rectangular waveguide?
14. How do you account for the finite conductivity of the conductor forming the walls of the wave guide?
15. Explain why TM_{01} and TM_{10} modes in a rectangular guide do not exist?
16. What is the significance of propagation constant being imaginary, zero and real?
17. Explain what is the suitable mode in circular wave guide for making a wave meter?
18. Will the Q of a circular cylindrical cavity resonator be higher or lower by increasing its length? Give physical reasoning?
19. What is the relationship between loaded, unloaded and external Q of a cavity resonator?
20. What are degenerate modes?

PART - B

(5 x 12 = 60 MARKS)

ANSWER ANY FIVE QUESTIONS

21. Obtain the expressions for current and voltage at any point along a line, which is terminated in its characteristic impedance.

22. (a) What is distortion less line? Derive the condition for a distortion less line. (8)

(b) A transmission line has the following parameters per km R = 15Ω, C= 15Mf, I = 1 mH, G = 1 μmho. Find the additional inductance to give distortion less transmission. Calculate α and β for this inductance added line. (4)

23. (a)What is quarter wave line?. Discuss its applications. (4)

(b) A load (50-j100) ohms is connected across a 50 ohms line. Design a short circuited stub to provide matching between the two at a signal frequency of 30 MHz. (8)

24. (a) Derive the expressions for field components of a TE wave in parallel plate wave guide (8)

(b) If the plate separation is 10 cm, find the propagation constant, phase velocity, group velocity and wave impedance at 6 GHz for TE_{10} mode. (4)

25. Derive the expression for attenuation constant of TE waves in between two parallel conducting planes.

26. (a) Determine the solutions of electric and magnetic fields of TE wave in a rectangular guide. (8)

(b) An air filled rectangular copper wave guide with a=2.28 cm and b=1.01 cm is operated at 9.2 Ghz in dominant mode. Determine the guide wave length. (4)

27. (a) Explain the different methods of excitation of modes in circular guide (6)

(b) An air filled circular guide having inner diameter of 6 cm is excited at 9 GHz in dominant mode. Find (1) cut off frequency (2) wave impedance (3) cut off wave length. [$(ha)'_{11}$ = 1.84]. (6)

28. Derive the expression for unloaded Q of rectangular cavity (axbxc), a>b excited in dominant mode

******THE END******