

ANNA UNIVERSITY OF TECHNOLOGY, COIMBATORE
B.E. / B.TECH. DEGREE EXAMINATIONS : NOV / DEC 2011
REGULATIONS : 2008
FIFTH SEMESTER : ECE
080290031 - TRANSMISSION LINES AND WAVEGUIDES

Time : 3 Hours

Max.Marks : 100

PART - A

(10 x 2 = 20 MARKS)

ANSWER ALL QUESTIONS

1. Define characteristic impedance and propagation constant of transmission line.
2. What is the physical significance of an infinite line?
3. Write some applications of smithchart.
4. Distinguish between single stub and double stub matching.
5. What are guided waves?
6. Plot the frequency Vs attenuation characteristic curve of TM and TE waves guided between parallel conducting plates
7. Write the expression for TE waves in rectangular guide
8. What is the dominant mode for the TE and TM waves in the rectangular waveguide?
9. What is the resonant frequency of a microwave resonator?
10. Distinguish between wave guide and cavity resonator.

PART - B

(5 x 16 = 80 MARKS)

ANSWER ALL QUESTIONS

11. a) Obtain the general solution for voltages and currents at any point on the transmission line.

(OR)

11. b) i) Derive the condition for distortion less line. (6)

ii. A cable has the following parameters.

$$R = 48.75 \Omega/\text{km}$$

$$L = 1.09 \text{ mH}/\text{km}$$

$$G = 38.75 \mu\text{hos}/\text{km}$$

$$C = 0.059 \mu\text{f}/\text{km}$$

Determine the characteristics impedance, propagation constant and wavelength for a source of $f = 1600\text{Hz}$ and $E_s = 1 \text{ volt}$. (10)

12. a) A load of $(50 - j 100) \Omega$ is connected across a 50Ω line. Design a short circuited stub to provide matching between the two at a signal frequency of 30 MHz using smith chart.

(OR)

12. b) i. A 70Ω line is used at a frequency where wavelength equals 80cm terminated by a load of $140 + j91 \Omega$. Find the reflection co-efficient and VSWR using smith chart. (8)

- ii. What is SWR? Derive SWR in terms of reflection co-efficient. (8)

13. a) Derive the attenuation constant of TE waves in parallel plane waveguide.

(OR)

13. b) i. Derive the field components of TM waves between parallel plates propagating in z direction. (8)
- ii. For a frequency of 6GHz and plane separation of 7cm, find cut-off frequency and phase velocity for TE_{10} mode. (8)

14. a) A X band rectangular waveguide has inner dimensions of $a = 2.3$ cm, $b = 1$ cm. Calculate the cut-off frequency for the following modes. TE_{10} , TE_{20} , TM_{11} , TM_{12} . Also check which of the following modes propagate along the waveguide when the signal frequency is 10GHz. wave guide.

(OR)

14. b) i. TEM waves cannot exist in a single conductor – Justify using Maxwell's equation. (6)
- ii. Derive the attenuation constant of TE waves in rectangular waveguide. (10)
15. a) i. Determine the solution of electric and magnetic fields of TM waves guided along circular waveguide. (8)
- ii. Calculate the resonant frequency of a rectangular resonator with dimensions $a=3$ cm, $b=2$ cm and $d=4$ cm if the operating mode is TE_{101} . (8)

(OR)

15. b) Derive the Q factor of rectangular cavity resonator for TE_{101} mode.

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