13-12-22 - AN.

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90481

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Sixth Semester

Electronics and Communication Engineering

EC 8651 — TRANSMISSION LINES AND RF SYSTEMS

(Common to Electronics and Telecommunication Engineering)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define reflection factor and return loss.

2. Why loading of transmission line is done?

3. A loss less transmission line has L=2mH and C=8nf. Find the characteristic impedance and propagation constant at a frequency of 10 MHz.

4. A transmission line of characteristic impedance 75 ohms is terminated by resistance which has VSWR of 3. Find reflection coefficient at the load and load resistance.

5. Calculate the length of short circuit line to give an impedance of +j 20 ohms. The characteristic impedance of the line is 100 ohms.

6. A certain line of Ro=100 ohms is short at the termination. Find the impedance seen by the generator connected at a point $\frac{\lambda}{2}$.

7. What is dominant mode of propagation for rectangular waveguide?

8. A parallel plane guide having distance between them as 4 cm is filled with dielectric material with dielectric constant of 2. Find the cut off frequency, for TM_{11} mode.

9. Define cutoff frequency of microwave transistor.

10. Define stability of power amplifier.

PART B — (5 × 13 = 65 marks)

11. (a) Define transmission line parameters. Derive the transmission line equations from the equivalent circuit representation.

Or

(b) A generator of 2 volt and 10 MHz frequency is connected to a transmission line which has series impedance of 50+j50 ohms/km and shunt admittance of (2+j4) × 10^{-6} ohms/km. Find the characteristic impedance and propagation constant. Find the power delivered to the load impedance of impedance 100+j 100 ohms.

12. (a) Define the reflection coefficient and voltage standing wave ratio and draw the voltage and current waveforms when the transmission line is terminated by matched load, short circuit, open circuit and reactance terminations.

Or

(b) Find the required value of Zo of the transmission line of length $\beta l = \pi/2$ that will match 10 ohms load resistance to the generator. The generator internal resistance is 200 ohms. Find the VSWR and reflection coefficient on the line.

13. (a) A line of R_o = 300 ohms is connected to a load of 80 ohms resistance. For a frequency of 1MHz, find the length, termination of single stub nearest to the load to produce an impedance match. (Use smith chart).

Or

(b) Explain single stub matching of transmission line and derive the expressions.

14. (a) Discuss the characteristics: cut off frequency, cut off wave length, phase velocity, wave length, group velocity, and wave impedance for TE, TM and TEM waves between two conducting planes.

Or

(b) Derive the field expressions for Transverse Magnetic wave in a rectangular waveguide. Draw the field distribution for the lowest order mode.

15. (a) With neat diagram explain the stability consideration in design of RF amplifiers.

Or

(b) Explain the basic concepts and design of mixer.

PART C — (1 × 15 = 15 marks)

16. (a) A line is one wave length long and is open circuited. If a supply of 1 volt amplitude and 1 kHz frequency is connected to it. Find the incident, reflected and total voltage at $\lambda/16$ distance from the short. The line parameters are R=50 ohms, L=0.001 Henry, C=0.06 μF and 0=1.5 ohms.

Or

(b) A lossless line (7/16) λ long has an input impedance $Z_s / R_0 = 1.5 + j1.5$. Find the load impedance and standing wave ratio, amplitude and phase of reflection coefficient.

———————