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

Question Paper Code : 40988

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2024.

Fifth Semester

Electronics and Communication Engineering

EC 3551 – TRANSMISSION LINES AND RF SYSTEMS

(Common to : Electronics and Telecommunication Engineering)

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Note : Smith chart needs to be provided.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Characteristics impedance.

2. Recall the condition for distortion less transmission line.

3. What is standing wave ratio?

4. List the performance parameters of a high frequency transmission line.

5. What is the need for impedance matching?

6. Mention the applications of smith chart.

7. Define cutoff frequency of a waveguide.

8. Why does rectangular waveguides preferred over circular waveguides?

9. Distinguish between oscillator and mixer.

10. Mention the use of couplers in RF Transceivers circuits.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Discuss in detail about inductance loading of telephone cables and recall the attenuation constant, phase constant and velocity of signal transmission for the uniformly loaded cable. (7)

(ii) Describe about the reflection on a line not terminated in its characteristic impedance. (6)

Or

(b) Obtain the general transmission line equation for the voltage and current at any point on a transmission line.

12. (a) Explain in detail about the wavelength and VSWR measurement of the transmission line.

Or

(b) Explain in detail about the input impedance of open and short circuited transmission lines.

13. (a) Explain in detail about the single stub matching using smith chart.

Or

(b) (i) Explain the operation and application of quarter wave transformer. (8)

(ii) Compare single and double stub impedance matching procedures. (5)

14. (a) Explain the propagation of electromagnetic waves between parallel plane waveguides with appropriate mathematical expressions and diagrams.

Or

(b) Describe the TM field components using Bessel equation in circular waveguides with necessary diagrams.

15. (a) Explain the construction and functionality of RF Field effect transistors.

Or

(b) Explain the following

(i) High Electron Mobility Transistor (6)

(ii) Low noise amplifiers. (7)

PART C — (1 × 15 = 15 marks)

16. (a) A 50 Ω lossless line is to be matched to a load of $Z_L = 75 + j100\,\Omega$ with a shorted shunt-stub tuner. Determine the required stub admittance, its distance from the load and stub length using smith chart. Draw the transmission line and Matching network mention its length, position in the diagram.

Or

(b) A 30 m long lossless transmission line with $Z_0 = 50\,\Omega$ operating at 2 MHz is terminated with a load $Z_L = 60 + j40\,\Omega$. If $u = 0.6\ c$ (c is velocity of light, u is phase velocity) on the line, Find the following parameters with the help of smith chart.

(i) Reflection Coefficient

(ii) Standing wave ratio

(iii) Input impedance and admittance.

(iv) Maxima and minima position from the load

(v) Load admittance.