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

Question Paper Code : 20934

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023

Fifth Semester

Electronics and Communication Engineering

EC 3551 – TRANSMISSION LINES AND RF SYSTEMS

(Common to : Electronics and Telecommunication Engineering)

(Smith Chart must be provided)

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define transmission line.
2. State the properties of an infinite line.
3. Define skin effect.
4. Sketch the standing wave pattern on a line having short circuit termination.
5. Why quarter wave line is called as copper insulator?
6. Compare single stub matching and double stub matching.
7. List out the characteristics of TE waves.
8. Define wave impedance.
9. List the various types of mixers.
10. List the factors affecting amplifier performance.

PART B — (5 × 13 = 65 marks)

11. (a) Derive the expression for the attenuation and phase constants after obtaining an expression for the characteristic impedance.

Or

(b) (i) Draw and explain the reflection loss due to mismatch between source and load impedances. (7)

(ii) Illustrate the Z_o in terms of primary constants. (6)

12. (a) Identify the general expressions for voltage and current at any point on the radio frequency dissipationless line and draw the incident and reflected voltage wave for the successive instants of time.

Or

(b) Derive the expression for the input impedance of its dissipation less line and find the maximum and minimum impedances.

13. (a) Describe the impedance matching technique using single stub and obtain the expression for the stub location and stub length.

Or

(b) VSWR of a lossless line is found to be 5 and successive voltage minima are 40 cm apart. The first voltage minima is observed to be 15 cm from the load. The length of the line is 160 cm and Z_0 is 300 Ω. Apply the values in smith chart to find the load impedance and input impedance.

14. (a) Compute the field configuration, cut off frequency and velocity of propagation for TM waves in rectangular wave guides. (4+4+5)

Or

(b) A rectangular waveguide measuring a = 4.5 cm and b = 3 cm has a 9 GHz signal propagated in it. Calculate the guide wavelength, phase and group velocities for the dominant mode.

15. (a) Explain the construction and functionality of RF Field effect transistors. (6+7)

Or

(b) With reference to RF transistor amplifier, explain the considerations for stability and gain. (6+7)

PART C — (1 × 15 = 15 marks)

16. (a) Describe about the standing waves, nodes, antinodes and standing wave ratio. Obtain the relation between the standing wave ratio S and the magnitude of the reflection coefficient. (8+7)

Or

(b) State and formulate the transducer power gain, available power gain and operating power gain of a microwave amplifier in terms of S parameters and different reflection coefficient.

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