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Question Paper Code : 81239

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

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

(Use of smith chart is permitted)

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Write the relation between wavelength and velocity of propagation.
2. Define reflection coefficient.
3. State any two methods of measuring impedance on transmission lines.
4. Define VSWR.
5. Define single-stub matching.
6. Write the expression for input impedance in terms of the Smith chart.
7. Define dominant mode.
8. Define group velocity and phase velocity.
9. Define MMIC.
10. Write two applications of RF filters.

PART B — ($5 \times 13 = 65$ marks)

11. (a) Derive the condition for a line to be distortionless.

Or

- (b) Explain the concept of reflection coefficient and derive the expression for input impedance.

12. (a) Derive the expression for Standing Wave Ratio and explain its significance.

Or

- (b) Derive the input impedance of open and short-circuited lines at high frequencies.
13. (a) Explain impedance matching using a quarter-wave transformer with a derivation.

Or

- (b) An antenna, as a load on a transmission line, produces a standing wave ratio of 3, with a voltage minimum of 0.12λ from antenna terminals. Find the antenna impedance and reflection coefficient at the antenna, if R_0 is 300 ohms on the line (Use Smith chart).
14. (a) Derive the cut-off frequency for TE and TM modes in a rectangular waveguide.

Or

- (b) Explain the propagation characteristics of TE and TM waves in circular waveguides.
15. (a) Explain the construction and functionality of RF Field Effect Transistors.

Or

- (b) Explain the design and operation of filters, couplers, and power dividers in RF systems.

PART C — ($1 \times 15 = 15$ marks)

16. (a) A line of $R_0 = 300$ ohms is connected to a load of 73 ohms. For a frequency of 45 MHz, find the length and location of a single stub nearest the load to produce an impedance match using the Smith chart.

Or

- (b) Obtain the expression for TE waves between parallel plates and sketch the electric and magnetic field distributions for the TE₁₀ mode.