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Question Paper Code : 80533

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

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 characteristic impedance of a transmission line.
2. What is a distortion less line? Give the condition for a distortion less line.
3. A transmission line of 50Ω is terminated by a load impedance of 75Ω . Find its standing wave ratio.
4. What do you mean by return loss?
5. Mention the need of impedance matching.
6. List the applications of the smith chart.
7. Consider an air filled rectangular waveguide with a cross section dimension of $4 \text{ cm} \times 2.5 \text{ cm}$. Find the cutoff frequency of TM_{12} mode.
8. What are the dominant modes for TE and TM waves in rectangular waveguides?
9. Give the applications of voltage controlled oscillator.
10. Define transducer power gain of a power amplifier.

PART B — (5 × 13 = 65 marks)

11. (a) Explain in detail about the general theory of transmission lines with neat sketches.

Or

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

12. (a) Obtain the expression for voltage and current on the dissipation less line.

Or

- (b) Explain in detail about the input impedance of the dissipation less line with necessary assumptions.

13. (a) A load impedance of $Z_L = 30 - j40 \Omega$ is to be matched to a 50Ω line using a single series stub tuner. Using smith chart find at least 2 possible solutions of matching network design in short circuited configuration.

Or

- (b) (i) Derive the expression for input impedance of a quarter wave transformer and mention its applications. (8)

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

14. (a) Discuss the propagation of TE and TM waves in parallel plane waveguides with illustrations.

Or

- (b) Explain in detail about TE and TM waves and its modes of propagation in rectangular waveguides.

15. (a) Explain with necessary diagrams that various types of mixers and its principle of operation.

Or

- (b) Write short notes on the following :

- (i) RF field effect transistors (6)

- (ii) Stability consideration of RF power amplifier. (7)

PART C — (1 × 15 = 15 marks)

16. (a) A communication link has a resistance $R = 10.4 \Omega/\text{km}$, inductance $L = 3.67 \text{ mH}/\text{km}$, leakage conductance $G = 0.08 \mu\text{ mho}/\text{km}$ and capacitance $C = 0.0083 \mu\text{ F}/\text{km}$. At frequency $f = 1 \text{ kHz}$ obtain
- (i) Characteristic impedance of the line, (6)
 - (ii) Propagation constant (6)
 - (iii) Phase velocity (3)

Or

- (b) A load of $50 + j75 \Omega$ is connected to 100Ω lossless transmission line of length 0.33λ . Find the following parameters using smith chart.
- (i) Reflection Coefficient at the source and load (4)
 - (ii) Standing wave ratio (4)
 - (iii) Input impedance (4)
 - (iv) Input admittance (3)