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Question Paper Code : 70520

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

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 coefficient.

2. What are primary and secondary constants of a transmission line?

3. A transmission line of 60Ω is terminated by a load impedance of 75Ω. Find its return loss at the load.

4. What do you mean by dissipation less line?

5. Find the impedance of quarter wave transformer which is used to match 50Ω transmission line with 75Ω load.

6. What is the advantage of double stub matching over single stub matching?

7. Consider an air filled rectangular waveguide with a cross section of 5cm × 3cm. Find the cutoff frequency of TM_{12} mode.

8. Why rectangular waveguides are preferred over circular waveguides?

9. List the basic characteristics of a Mixer.

10. State the use of Low noise amplifiers in RF Transceivers circuits.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Obtain the input impedance of an open circuited and short circuited transmission lines. (8)

(ii) A transmission line of length 0.25λ and impedance 50Ω is terminated by a load impedance of 75Ω. Determine its input impedance. (5)

Or

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

12. (a) Write short notes on the following.

(i) Standing waves, VSWR and reflection losses. (7)

(ii) Power and impedance measurement of transmission lines. (6)

Or

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

13. (a) A 50Ω transmission line is connected to a load impedance of $(80+j120)\Omega$ at 10MHz. Evaluate the position and length of a short circuited stub required to match the line using smith chart.

Or

(b) (i) Derive the 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 rectangular waveguides.

Or

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

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

Or

(b) Illustrate the design principles of RF amplifier and its impedance matching procedure with necessary diagrams.

PART C — (1 × 15 = 15 marks)

16. (a) A Telephone line has a resistance $R = 30\Omega/km$, inductance $L = 100$ mH/km, leakage conductance $G = 0$ and capacitance $C = 20\,\mu F/km$. At frequency $f = 1\,kHz$ obtain

(i) Characteristic impedance of the line, (5)

(ii) Propagation constant (5)

(iii) Phase velocity. (5)

Or

(b) A load of $40+j70\,\Omega$ is connected to a 100Ω lossless transmission line of length 0.3λ. Find the following parameters using smith chart.

(i) Reflection Coefficient at the source and load (5)

(ii) Standing wave ratio (5)

(iii) Input impedance (2)

(iv) Input admittance. (3)