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Question Paper Code : 50498

B.E./B.Tech DEGREE EXAMINATIONS, APRIL/MAY 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 Characteristic Impedance.
2. What is distortion-less line? Give the condition for distortion-less transmission line.
3. Give the relationship between standing wave ratio and reflection coefficient?
4. Find the input impedance of an open circuited line.
5. Mention the advantages of double stub matching.
6. A quarter wave transformer is used to match a 10Ω load to a 50Ω transmission line at 2 GHz. Find the characteristic impedance of a quarter wave transformer.
7. Why TEM waves are not possible in rectangular waveguide?
8. Consider an air-filled rectangular waveguide with a cross section of 5cm × 3cm. Find the cutoff frequency of TE_{21} mode.
9. State the importance of Low noise amplifier in RF systems.
10. Distinguish between oscillator and Mixer.

PART B — (5 × 13 = 65 marks)

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

Or

(b) (i) What is a loading? Specify the types of loading in transmission lines. (7)

(ii) Briefly explain about reflection factor and reflection loss. (6)

12. (a) (i) Examine the voltage and currents at any point on the dissipation less line. (6)

(ii) Obtain the variation of input impedance along open and short circuited lines with relevant graphs. (7)

Or

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

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

(i) Reflection Coefficient at the source and load.

(ii) Standing wave ratio.

(iii) Input impedance.

Or

(b) Describe the single stub and double stub impedance matching procedure with appropriate transmission line parameters.

14. (a) Derive the Field components for Transverse Electric (TE) Mode of propagation in a parallel Plane wave guide.

Or

(b) In a rectangular wave guide find the transverse field components for Transverse Magnetic (TM) Model of propagation.

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

(i) Power amplifiers and power gain relations. (8)

(ii) High Electron Mobility Transistor. (5)

Or

(b) (i) Examine the Linearity, conversion gain, and isolation parameters of an RF mixer. (7)

(ii) Explain the basic RF design concepts of Voltage controlled oscillator. (6)

PART C — (1 × 15 = 15 marks)

16. (a) An antenna with an impedance of 40+j30 Ω is to be matched to a 100 Ω lossless line with a shorted stub. Using smith chart find all possible solutions to determine.

(i) The distance between the stub and antenna

(ii) The stub length

Or

(b) An air-filled rectangular Waveguide with dimensions 3 cm × 5 cm allows 10 GHz signal to propagate through it. Calculate the cut-off frequency, cut-off wavelength, guide wavelength and the characteristics, impedance of the wave for the TE_{10} mode of propagation.

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