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Question Paper Code : X10369

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2021
Sixth Semester
EC8651 – TRANSMISSION LINES AND RF SYSTEMS
(Common to : Electronics and Communication Engineering/Electronics and Telecommunication Engineering)
(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Smith Charts to be supplied
Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Define characteristic impedance. What determines the characteristic impedance of a transmission line ?

2. A 50Ω line is terminated into an infinite line. If it is fed by a 10V, 50Ω source, find the reflected and power transmitted into infinite line.

3. A λ/8 transmission line is terminated by 25 + j50Ω. If the characteristic impedance of the line is 100 Ω. Find input impedance of the line.

4. A 50Ω line operating at 1 GHz is terminated by a load of 20Ω. Find the values of maximum and minimum impedance and their location on the line.

5. What is the outer circle present on the smith chart ? One complete revolution around a Smith chart represents how many wavelengths ?

6. Mention the two applications of quarter wave transmission line.

7. Define group and phase velocity.

8. A waveguide is generally operated at f = 1.5 f_c where f_c is the cutoff frequency. Assuming that the broader dimension is twice the other dimension in a rectangular waveguide, calculate the dimension if it operates in TE_{10} mode at 6 GHz.

9. Define the condition for stability in circuit design.

10. Mention the requirements and applications of low noise amplifiers.

PART – B **(5×13=65 Marks)**

11. a) Define wave form distortion on a transmission line. Determine the condition for distortion less transmission line. How can a transmission line be made distortion less ?

(OR)

b) A 50Ω line is matched to a 10 V source and feeds a load of 100Ω. If the line is 2.3λ long, λ being the wavelength and has an attenuation α = 0.5 dB/λ, find the power delivered to the load.

12. a) Define input impedance of a transmission line. A lossless transmission line of length 1 meter and characteristic impedance 100Ω is terminated in a load Z_L = 100 – j200 Ω. Determine the line impedance at a distance of 25 cm from the load if it is fed by a matched source operating at 10 MHz.

(OR)

b) Define Reflection coefficient and VSWR. A 100Ω line is terminated in a load 50 + j1000 Ω. If the line is 0.4λ find the reflection coefficient at the load, reflection coefficient at the input and VSWR.

13. a) Describe quarter wave transmission line. Discuss the applications of quarter wave transmission line.

(OR)

b) An antenna, as 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 factor at the antenna, if R_o is 300 ohms on the line (Use smith chart).

14. a) Discuss the propagation of Transverse Electric waves between parallel plates.

(OR)

b) Determine possible modes of propagation for a rectangular waveguide of dimensions 7 cm × 3.1 cm at a frequency of 12 GHz.

15. a) Explain the power amplifiers used at RF frequencies.

(OR)

b) Explain the working of FET at RF frequencies.

PART – C **(1×15=15 Marks)**

16. a) A line of Ro = 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 Smith chart.

(OR)

b) A rectangular waveguide is to be designed to operate at a frequency 10 GHz. It is desired that the frequency of operation be 15% above the cutoff frequency of the operating frequency and 20% below the cutoff frequency of the next higher mode, determine the dimensions of the waveguide. Determine the propagation constant, phase velocity and group velocity at 10 GHz. Represent the Electric and Magnetic field distribution at 10 GHz in the waveguide.

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