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Question Paper Code : 20478

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Sixth Semester

Electronics and Communication Engineering

EC 8651 – TRANSMISSION LINES AND RF SYSTEMS

(Common to Electronics and Telecommunication Engineering)

(Smith Chart is permitted)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define characteristic impedance.

2. What is meant by loading of transmission line?

3. An open circuited loss less transmission line has $Z_o = 100\Omega$ is of length $\lambda/8$. Find the input impedance.

4. A transmission line of characteristic impedance 50 ohms is terminated by 150+j50 ohms impedance. Determine the reflection coefficient at the load and VSWR along the transmission line.

5. Represent the variation of impedance of short circuit transmission for a distance of one wavelength.

6. List the applications of smith chart.

7. Define cut off frequency and cut off wavelength of modes of propagation in rectangular waveguides.

8. Represent the field distribution of dominant mode in parallel plates.

9. Differentiate between PN junction and Schottky contact.

10. Define intermodulation distortion.

PART B — (5 × 13 = 65 marks)

11. (a) What are the salient aspects of primary constants of a two wire transmission line? Determine the voltage and current expressions of two wire transmission line.

Or

(b) Define wave form distortion. A transmission line is to have no distortion with the following parameters: R = 20 ohms/km, G= 5×10^{-6} mho/km, C=0.005 µF/Km . Determine Series Inductance to be added to make the line distortion less and find the velocity and phase constant of the line at 20MHz.

12. (a) Discuss $\lambda/2$ and $\lambda/4$ length transmission lines and list its applications.

Or

(b) Distinguish between lossless and distortion less transmission lines.

13. (a) A line of R_0 = 300 ohms is connected to a load of 50 ohms resistance. For a frequency of 50 Hz, find the length, termination of single stub nearest to the load to produce an impedance match. (Use smith chart)

Or

(b) Discuss the double stub matching of a transmission line.

14. (a) A waveguide with parallel-plates separated by 1cm is filled with a dielectric with relative permittivity 2 and operates at 12GHz.

Determine:

(i) cutoff frequency

(ii) the phase constant (β)

(iii) the phase velocity

For the first five modes.

Or

(b) Discuss the propagation of TE waves between parallel planes and derive the expressions for electric and magnetic fields.

15. (a) Explain the design of Power amplifiers.

Or

(b) Explain the principle and working of RF field effect transistor.

PART C — (1 × 15 = 15 marks)

16. (a) A generator of 1 volt and 1 MHz frequency is connected to a transmission line which has series impedance of 20+j25 ohms/Km and shunt admittance of $(3+j5)\times10^{-6}$ ohms/Km. Find the characteristic impedance and propagation constant. Find the current, voltage along the transmission line at a distance of 10km.

Or

(b) An antenna as a load on a transmission line produces a standing wave ratio of 2.8, with a voltage minimum 0.1 λ from the antenna terminals. Find the antenna impedance and the reflection factor `K' at the antenna if R_o=300 ohms for the line.

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