Reg. No. :

Question Paper Code: 31454

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Fifth Semester

Electronics and Communication Engineering

01UEC504 - TRANSMISSION LINES AND WAVEGUIIDES

(Regulation 2013)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. For a symmetrical network, define propagation constant and characteristic impedance.

2. List the properties of symmetrical networks.

3. State the important properties of the infinite line.

4. Write the expressions for the phase constant and velocity of propagation for telephone cable.

5. List the characteristics of TEM waves.

6. Define the terms phase velocity and group velocity.

7. Write Maxwell's equations.

8. What are dominant mode and degenerate modes in rectangular waveguide?

9. Define the quality factor of a resonator.

10. List the applications of cavity resonator.

PART - B (5 x 16 = 80 Marks)

11. (a) Derive expressions for characteristics impedance and propagation constant of a symmetrical π network. (16)

Or

(b) (i) Design m-derived high pass filter with a cut-off frequency of 10kHz; design impedance of 5Ω and m=0.4. (8)

(ii) Design a low pass filter (both π and T-sections) having a cut-off frequency of 2 kHz to operate with a terminated load resistance of 500Ω. (8)

12. (a) Derive the general transmission line equation for voltage and current at any point on a line. (16)

Or

(b) (i) Derive the conditions required for distortion less line. (8)

(ii) A transmission line has the following per unit length parameters: L=0.001 H, R=100 ohms=0.062μF and G=1.5μ mho. Calculate the propagation constant and characteristic impedance at w=1000 rad/sec. Determine Z_0, propagation constant at a frequency of 796 Hz. (8)

13. (a) A 75Ω lossless transmission line is to be matched with 100-j80 Ω load using single stub. Calculate the stub length and its distance from the load corresponding to the frequency of 30 MHz using SMITH chart. (16)

Or

(b) (i) Derive the expression for the input impedance of a dissipation line. (8)

(ii) A transmission line has a characteristics impedance of 300 Ω and terminated in a load Z_L=150 + j150 Ω .Find the following using smith chart. (a) VSWR (b) Reflection coefficient (c) Input impedance at distance 0.1λ from the load (d) Input admittance from 0.1 λ from load. (8)

14. (a) Derive the expression for the field strengths for Transverse Electric waves between a pair of parallel perfectly conducting planes of infinite extent in the 'Y' and 'Z' directions. The planes are separated in X direction by "a" meter. (16)

Or

(b) (i) Discuss the characteristics of TE, TM and TEM waves between parallel conducting planes and also derive the cut-off frequency and phase velocity from the propagation constant. (10)

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(ii) TEM wave cannot exist in a single-conductor waveguide-Justify the statement using Maxwell's equation. (6)

15. (a) (i) Derive the equations to give the relationships among the fields within rectangular guide. (8)

(ii) What is meant by cavity resonator? Derive the expression for the resonant frequency of the rectangular cavity resonator. (8)

Or

(b) Derive the field configuration, cut off frequency and velocity of propagation for TM waves in rectangular wave guide. (16)

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