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Question Paper Code: 1065025

B.E. / B.Tech. DEGREE EXAMINATIONS, NOV/ DEC 2024
Fifth Semester
Electronics and Communication Engineering
U20EC501- TRANSMISSION LINES AND WAVEGUIDES
(Regulation 2020)

Time: Three Hours Maximum: 100 Marks

Answer ALL questions

PART – A (10 x 2 = 20 Marks)

1. Recall the general solution for the voltage V (z) and current I (z) on a transmission line.

2. How does the wavelength velocity of propagation v_p relate to the frequency f and the wavelength λ on a transmission line?

3. Define the reflection coefficient Γ for a transmission line terminated with an impedance Z_L.

4. Recall standing wave in the context of transmission lines.

5. Tell the main purpose of using a Smith chart in transmission line analysis.

6. Differentiate between single stub matching and double stub matching techniques.

7. Define a Transverse Electromagnetic (TEM) wave.

8. What boundary conditions must be satisfied for a TE mode in a rectangular waveguide?

9. State the difference between a low-pass filter and a high-pass filter.

10. Recall 'crystal filter' and its primary advantage.

PART – B (5 x 16 = 80 Marks)

11. (a) Explain the concept of waveform distortion in transmission lines. How does the length of the transmission line and the frequency of the signal affect waveform distortion? Provide an example of how this distortion can be mitigated. (16)

(OR)

(b) Discuss the effect of a series inductor placed at the load end of a transmission line. How does this addition influence the impedance matching and reflection coefficient? Explain using the concept of impedance transformation. (16)

12. (a) Discuss the effects of an open circuit and a short circuit on the voltage and current standing waves in a transmission line. (16)

(OR)

(b) Describe how impedance mismatch affects the performance of a transmission. (16)

13. (a) Derive the equation for the characteristic impedance of a quarter-wave transformer and explain how it achieves impedance matching. (16)

(OR)

(b) Derive the formula for the impedance transformation in a transmission line of length l and discuss how the impedance transformation affects impedance matching. (16)

14. (a) Derive the field equations for TE modes in a rectangular waveguide and explain how you determine the cut-off frequency. (16)

(OR)

(b) Compare TE and TM modes in a circular waveguide. Provide the field distributions and boundary conditions for each. (16)

15. (a) Describe the design process of a constant-K filter. (16)

(OR)

(b) Describe the fundamental principles of filter design. (16)

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