PVP 14

Code: EC5T2

III B.Tech - I Semester–Regular/Supplementary Examinations
March 2021

TRANSMISSION LINES AND WAVE GUIDES
(ELECTRONICS AND COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) Draw the equivalent circuit of a transmission line and list out the different components.
b) Discuss the conditions for lossless transmission lines.
c) Explain phase and group velocities.
d) Explain reflection coefficient and voltage standing wave ratio.
e) A lossy cable which has R = 2.25 Ω/m, L = 1.0μH/m, C= 1 pF/m and G = 0 operates at f = 0.5 GHz. Calculate the attenuation constant of the line.
f) Mention the different applications of smith chart.
g) List out the Maxwell's equations for time varying fields in integral form.
h) Calculate the broad wall dimension of a rectangular waveguide when the cut-off frequency for TE_{10} mode is 3 GHz.

i) List out any two propagation parameters of TE and TM waves in rectangular waveguides.

j) Explain evanescent wave or mode.

k) Explain any two excitation methods for different TE and TM waves/modes.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) With necessary conditions derive the transmission line equations. 8 M

b) Explain phase and group velocities. Explain different types of loading. 8 M

3. a) What is characteristic impedance. Derive the relation between reflection coefficient, load and characteristic impedance. 8 M

b) A lossless transmission line is terminated with a load impedance of 30-j23Ω. Calculate the phase constant and the reflection coefficient of a line 50m. characteristic impedance $Z_0 = 50\Omega$ and wavelength of the line is 0.45m. 8 M

4. a) Discuss the steps involved in the design of single stub matching. 8 M

b) Explain in detail about the quarter wave transformer. 8 M

5. a) Explain the field components for TE waves in a rectangular waveguide. 8 M

b) A rectangular waveguide with dimensions of 3 x 2 cm operates at 10 GHz. Calculate the cut-off frequency, wavelength, cut-off wavelength, guided wavelength, phase constant and phase velocity of TE_{10} mode. 8 M

6. a) Explain the salient features of circular waveguides. 8 M

b) Explain briefly about the dominant mode, degenerate mode and quality factor of a rectangular cavity resonator. 8 M