B.E DEGREE EXAMINATIONS: APRIL /MAY 2024

(Regulation 2018)

Fourth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U18ECT4104: Transmission Lines and Waveguides

Smith Chart to be Provided

COURSE OUTCOMES

CO1:   Discuss the fundamental concepts of wave propagation in Transmission Lines and Wave

   Guides.

CO2:   Analyze the line parameters and various losses in transmission lines.

CO3:   Apply smith chart for line parameter and impedance calculations.

CO4:   Evaluate the characteristics of Parallel plane and Rectangular wave guides.

CO5:   Evaluate the characteristics of Circular wave guides and Rectangular cavity resonators.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1.   A line operated at 1.6 GHz has parameters of L=0.002uH/m, C=0.012pF/m, R=0.015 Ω/m and   CO1   [K3]

   G=0.1mS/m, Find Z, Y and Z0.

2.   State the conditions for the distortion less line.   CO1   [K2]

3.   List the assumptions for the analysis of the performance of the radio frequency line.   CO2   [K2]

4.   Define Reflection factor and Reflection loss.   CO2   [K2]

5.   Give reasons for preferring a short- circuited stub when compared to an open –circuited stub.   CO3   [K2]

6.   Compare single stub with double stub matching.   CO2   [K3]

7.   Give the reason for impossibility of TEM waves in waveguides.   CO4   [K3]

8.   Find the cutoff frequency of an air-filled rectangular waveguide with dimensions of 8x4 cm   CO4   [K3]

   for TE_{10} mode.

9.   Define quality factor of a resonator.   CO5   [K2]

10.   A circular waveguide operated at 11GHz has an internal diameter of 4.5 cm. For a TE10 mode   CO5   [K3]

   propagation calculate λ and λc.

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.		Derive the general solution for voltage and current at any point on a line in two standard forms and explain its physical significance.	16	CO1 [K2]
12.	a)	Discuss the types of waveform distortion on a transmission line and obtain the condition for distortion less line.	10	CO2 [K3]
	b)	A transmission line has the following parameters L=0.1 µH, R= 5Ω, C=300pF, G=0.01 mho. Find γ, Zo of a line at 500 MHz	6	CO2 [K3]
13.		A slotted line measurement of a transmission line with a characteristic impedance of 60Ω indicates a VSWR of 4.0 and the location of the first voltage minima of the standing wave pattern to be 0.1 λ from the load. Assuming d_1=0.05 λ and d_2=0.375 λ and using the Smith chart find the lengths of the two stubs to achieve a match between the line and the load.	16	CO3 [K4]
14.	a)	Derive the components of electric and magnetic field strength between a pair of perfectly conducting planes of infinite extent in Y and Z directions. The planes are separated in X direction by 'a' meter.	12	CO4 [K3]
	b)	For a frequency of 5GHz and plane separation of 4cm for TM_{10} mode, find cutoff frequency and cutoff wavelength.	4	CO4 [K3]
15.	a)	Obtain the solution for electric and magnetic field components of TE waves along rectangular waveguide	12	CO4 [K3]
	b)	In TE10 mode of wave propagation in a rectangular waveguide, if the broader dimension of the waveguide is 40 cm, find the cutoff wavelength for that mode.	4	CO4 [K3]
16.		Derive the unloaded quality factor of a rectangular cavity resonator (a x b x d) excited in TE_{101} mode for d>a>b. What is the condition for maximum Q?	16	CO5 [K3]

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