Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, MAY 2024

Electronics and Communication Engineering

Vth Semester

EC7503 Transmission lines and waveguides

Smith Chart must be included

(Regulation2015)

Time: 3hrs | Max. Marks: 100

PART- A(10x2=20Marks)

(Answer all Questions)

Q.No	Questions	Marks
1	A transmission line of characteristic impedance 50Ω is loaded with a load impedance $Z_L = R + jX_L$. The magnitude of the reflection coefficient at the load is measured to be 0.5. If the real part of the load impedance is R = 60Ω, find the number of possible values for the imaginary part X_L of the load impedance.	2
2	A coaxial cable of unknown length is short-circuited on one end and the impedance on the other end is measured to be 26Ω. The measured impedance when it is open-Circuit is 100Ω. Find the characteristic impedance of the line.	2
3	If a transmission line is terminated by a short circuit load, open circuit load and characteristic impedance. Draw the voltage and current waveforms for all the conditions.	2
4	Why we go for double stub matching network?	2
5	Prove $Zo=\sqrt{Zsc.Zoc}$	2
6	Draw the variation of α and β with frequency for the constant k prototype low pass filter.	2
7	How modes are excited in the rectangular waveguide?	2
8	A copper rectangular cavity resonator is structured by 3X1X 4 cm. Find its resonant frequency for TM_{110} mode.	2
9	Draw the TE01 and TM01 field variations in circular waveguide.	2
10	What is meant by loaded and unloaded Q?	2

PART- B(5x 13=65Marks)

(Restrict to a maximum of 2 subdivisions)

Q.No	Questions	Marks
11 (a) (i)	Derive the general solution of the transmission line and explain	8
(ii)	A line of 0.128 inch open wire is 100 miles long and terminated in Z_o. Find Z_o,α,β,γ. Assume R=6.74 Ω,L=0.00353 H, C=0.00871μF. G= 0.29 μmho.	5
	(OR)	
11 (b) (i)	Derive the condition for a distortion less transmission line	5
(ii)	A transmission line has an input impedance as source 200 Ω and terminated by the load impedance at the receiver is 600—j150Ω. The characteristic impedance given is 400 Ω. Find the reflection and return loss.	8

12 (a) (i)	Discuss in detail about λ /8, λ /4 and λ /2 lines with relevant expressions	8
(ii)	ii) Explain the method of single stub matching	5
	(OR)	
12 (b) (i)	Using smith chart find the lengths of the double stub tuner for the normalized load impedance 0.5+j0.6 , distance between stubs is 0.125 λ and distance from load to first stub is 0.125 λ. SC, shunt stubs are used.	13
13 (a) (i)	Derive the expression which predicts the filter performance	5
(ii)	A T section low pass filter has L= 80 mH and shunt capacitance C =0.022 μF. Determine the cutoff frequency , nominal design impedance	8
	(OR)	
13 (b) (i)	Derive the design equation of lattice type attenuator	8
(ii)	Design a T type symmetrical attenuator which offers 40dB attenuation with load of 400Ω	5
14 (a) (i)	What is mode? Explain TE modes in parallel conducting plate with field diagrams and Derive the characteristics of the rectangular waveguide	8
(ii)	The cut-off frequency of the m = 1 TE mode in an air-filled parallel waveguide is known to be f_c = 7.5 GHz. The guide is used at a wavelength of λ = 1.5 cm. Find the group velocity of the m = 2TE mode.	5
	(OR)	
14 (b) (i)	Derive the solution of the equation for TM waves in rectangular waveguide.	13
15 (a) (i)	Describe about TE and TM waves in circular guides.	13
	(OR)	
15 (b) (i)	What are the features of a cavity? Find the resonant frequencies of the lowest mode of an air filled rectangular cavity of dimensions 5cmx4cmx2.5cm	8
(ii)	What are the three important modes of practical interest in circular cavity? What are advantages of TE_{011} mode in circular cavity	5

PART- C(1x 15=15Marks)

(Q.No. 16 is Compulsory)

Q.No	Questions	Marks
16 (i)	Discuss the various features of 'waveguide Modes'	10
(ii)	Compare the salient features of metallic rectangular waveguide with dielectric slab waveguide?	5