Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 7014

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – MAY / JUNE 2024
Fifth Semester
Electronics and Communication Engineering
U19EC520 – TRANSMISSION LINES AND WAVEGUIDES
(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions
(Smith Chart is to be provided)

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	How would you relate the units Decibel and Neper.	2	K2	CO1
2.	Determine the attenuation and phase shift constant of a wave propagating along a line whose propagation constant is $2.5 \times 10^{-4} \angle 75^{\circ}$	2	K2	CO1
3.	Determine the reflection co-efficient of a line when Z_L=200 Ω and Zo = $692 \angle -12^{\circ}\Omega$.	2	K2	CO2
4.	Compare λ/4 line with λ/2 line.	2	K2	CO2
5.	Define cut-off frequency of a waveguide.	2	K1	CO3
6.	What are higher order modes? How it differs from dominant mode?	2	K1	CO3
7.	What is the use of rectangular and circular cavity structure?	2	K2	CO4
8.	How can a waveguide be excited?	2	K2	CO4
9.	List the applications of planar transmission lines.	2	K1	CO5
10.	Draw the geometrical structure of coplanar strip line.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	Derive the condition for distortion less transmission line.	5	K2	CO1
		ii.	The characteristic impedance of a transmission line at 8 MHz is (40-j2) Ω and the propagation constant is (0.01+j0.18) per meter. Calculate the primary constants of the transmission line.	8		
			(OR)			
	b)		Derive the expression for the input impedance of a two wire transmission line with arbitrary load conditions.	13	K2	CO1
12.	a)		Derive the expressions for voltage and current at any point along the line which is operating at radio frequencies.	13	K2	CO2
			(OR)			
	b)		An air filled two wire line has a characteristic impedance of 50 Ω and is operated at f = 3 GHz. The load impedance is 100 + j40 Ω. Determine the following parameters using smith chart.		K3	CO2
		i.	The normalized load impedance.	3		
		ii.	The line impedance at 2.5cm from the load.	4		
		iii.	VSWR	3		
		iv.	Reflection coefficient	3		
13.	a)		Derive the field components of TM waves between perfectly conducting parallel plane waveguides.	13	K2	CO3
			(OR)			
	b)	i.	Discuss the characteristics of TM wave propagation in rectangular waveguide.	6	K2	CO3
		ii.	A parallel plane waveguide with plate separation of 7 cm operates at 6 GHz in TE_1 mode. Determine the cutoff frequency, group velocity and phase velocity.	7	K3	
14.	a)		Describe the propagation of Electromagnetic waves in Circular waveguides with necessary expressions and diagrams.	13	K2	CO4
			(OR)			
	b)		Discuss in detail about rectangular cavity resonator with necessary diagrams and expressions.	13	K2	CO4
15.	a)		With neat structural diagram describe in detail about the characteristics of Micro strip lines.	13	K2	CO5
			(OR)			
	b)		Compare various types of modern planar transmission lines.	13	K2	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	An air filled circular cavity resonates at 5 GHz in TM_{010} mode has a length of 4cm and radius 2.5cm. Find the resonant frequency, resonant wavelength, phase velocity and group velocity. The resonator is now filled with a lossless dielectric material with a dielectric constant of 2.4. Calculate the new resonant frequency.	15	K3	CO5
		(OR)			
	b)	i. With the necessary diagrams prove that the sections of RF transmission lines terminated with open or short circuit can be used as impedance matching devices.	6	K3	CO2
		ii. A lossless transmission line of length 0.434 λ and characteristic impedance of 100 Ω is terminated in an impedance of 260+j180 Ω. Using analytical expressions, determine the SWR, Reflection co-efficient and the input impedance.	9	K3	CO2