Sub Code: R2322042

R23

Set No. 1

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-GURUJADA VIZAINAGARAM
II B. Tech II Semester Supplementary Examinations NOV-2025
EM WAVES AND TRANSMISSION LINES
(ECE)

Time: 3 hours **Max. Marks: 70**

The Question paper consists of Part A & Part B.
Part A is compulsory, Answer all questions.
Part B Answers any one question from each unit.
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1		PART-A	(20Marks)
	a)	Derive units for Permittivity and Electric flux density	[2]
	b)	Derive units for Permeability and Magnetic flux density	[2]
	c)	Derive units for vector magnetic and scalar magnetic potentials	[2]
	d)	Derive units for magnetic field Intensity and electric field intensity	[2]
	e)	Derive units for skin depth	[2]
	f)	Derive units for polarization and Poynting vector	[2]
	g)	Define surface impedance and derive units.	[2]
	h)	Derive units for propagation constant	[2]
	i)	Derive units for characteristic impedance.	[2]
	j)	Derive relation between VSWR and reflection coefficient for transmission lines	[2]
		PART-B	(50Marks)
		Question from **Unit - I**	
2	a)	Derive the Poisson's and Laplace's Equations.	[5]
	b)	Find the force on a charge of -100mc located at P(2, 0, 5) in free space due to another charge 300μC located at Q(1, 2, 3).	[5]
		(OR)	
3	a)	Define Electric potential and derive the relationship between electric potential and electric field.	[5]
	b)	Determine the capacitance of a coaxial cable per unit length using Maxwell's equations.	[5]
		Question from **Unit - II**	
4	a)	Clearly explain why (del X H)=J is to be modified for the magnetic fields which varys with time. Obtain the modified expression.	[5]
	b)	A circular loop conductor of radius 0.1m lies in the z=0plane and has a resistance of 5Ω given B=0.20 sin 103 t az T. Determine the current	[5]
		(OR)	
5	a)	Show that the normal component of Magnetic flux density (B) is continuous for conductors	[5]
	b)	In a conducting medium H =y A/m. Find the current density at (1,0,-3) and calculate the current passing through Y =1 plane, $0 \le x \le 1$, $0 \le z \le 1$.	[5]
		Question from **Unit - III**	
6	a)	What is Complex pointing vector and it's physical interpretation? Determine the average power.	[5]
	b)	A perpendicularly polarized wave is incident at an angle of θ i = 150 . . It is propagating from medium1 to medium2 . Medium1 is defined by εr1 = 8.5, μr1 = 1 and σ1 = 0and medium2 is free space. If Ei = 1.0 mV/m, determine Er, Hi , Hr, E_t and H_t .	[5]
		(OR)	
7	a)	Define Brewster and Critical angles. What happens for the Brewster angle, when a wave is perpendicularly polarized	[5]
	b)	Derive an expression for Brewster angle when a wave is parallel polarized	[5]

Question from **Unit - IV**

8	a)	Give T and Π equivalent network representations for a transmission line and explain.	[5]
	b)	A two-wire line has a characteristic impedance of 200Ω and is fed to a 70 Ω resistor at 90 MHz. A quarter wave line is to be used as a tube, 0.15 inch in diameter. Find center-to-center spacing in vacuum?	[5]

(OR)

9	a)	Prove that a line of finite length terminated by its characteristic impedance Zo is equivalent to an infinite transmission line?	[5]
	b)	If $\varepsilon r = 9$, $\mu = \mu 0$. For the medium in which a wave with a frequency of f = 0.3 GHz is propagating, determine the propagation constant and intrinsic impedance of the medium when $\sigma = 0$ and $\sigma = 10$ mho/m.	[5]

Question from **Unit - V**

10	a)	Find the input impedance, SWR, and reflection constant of the transmission line.	[5]
	b)	The reflection coefficient at load is 0.5 |30 0. The characteristic impedance is 100 Ω. At 200MHz, calculate- i. The position of Vmin nearest to the load. ii. The ratio of voltage to current at the load. iii. The value of the load, and VSWR.	[5]

(OR)

11	a)	Explain the principle of Impedance matching with quarter wave Transformer?	[5]
	b)	A 50Ω loss less line connects a signal of 50 KHz to a load of 140Ω. The load power is75Mw. Calculate (i) Voltage Reflection coefficient (ii) VSWR (iii) Position of Vmax, Imax, Vmin and Imin.	[5]

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