CODE No.: 19BT30401 SVEC-19

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to JNTUA, Ananthapuramu)

II B.Tech I Semester (SVEC-19) Regular Examinations February – 2021

ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

[Electronics and Communication Engineering]

Time: 3 hours **Max. Marks: 60**

Answer One Question from each Unit
All questions carry equal marks

UNIT-I

1.	a)	Derive an expression for the continuity equation and explain its significance.	6 Marks	L1	CO1	PO1
	b)	Point charges of 30 nC each are located at A(2, 0, 0), B(-2, 0, 0), C(0, 2, 0) and D(0, -2, 0) in free space. Find the total force on the charge at A.	6 Marks	L3	CO1	PO1
		(OR)				
2.	a)	Determine magnetic field intensity about an infinitely long straight current carrying filament and also sketch the resulting magnetic flux lines.	6 Marks	L2	CO1	PO2
	b)	The point charge Q = 18 nC has a velocity of 5×10^6 m/s in the direction $0.6\hat{a}_x + 0.75\hat{a}_y + 0.3\hat{a}_z$. Calculate the force exerted on the charge by the field $\bar{B} = \left(-3\hat{a}_x + 4\hat{a}_y + 6\hat{a}_z\right) mT$.	6 Marks	L3	CO1	PO1

UNIT-II

3.	a)	State and prove Maxwell's four equations for time varying fields.	6 Marks	L1	CO2	PO2
	b)	In a medium of conduction current density given by $\mathbf{J} = 6\cos(\omega t - 10z)\,\mathbf{a}_y + \sin(\omega t - 10z)\,\mathbf{a}_z$ mA/m^2, find the volume charge density.	6 Marks	L3	CO2	PO1
		(OR)				
4.	a)	Determine the boundary conditions for electrostatic fields at a conductor – dielectric interface.	6 Marks	L1	CO2	PO2
	b)	Derive boundary conditions for magnetostatic fields.	6 Marks	L1	CO2	PO2

UNIT-III

5.	a)	Derive expression for resultant fields due to oblique incidence of an EM wave on a perfect conductor.	6 Marks	L1	CO3	PO2
	b)	If there is a magnetic field represented by $B = 2\sin(\omega t - \beta x)\,\mathbf{a}_x + 2y\cos(\omega t - \beta x)\,\mathbf{a}_y$ in a medium where $\boldsymbol{\rho}_v=0$, $\sigma=0$, J=0, find the electric field. Assume $\boldsymbol{\varepsilon}_r = 1$ and $\boldsymbol{\mu}_r=1$.	6 Marks	L4	CO3	PO2
		(OR)				
6.	a)	Show that the ratio of E and H in a uniform plane wave is approximately equal to 377Ω.	6 Marks	L1	CO3	PO2
	b)	Discuss in detail the various ways in which a plane wave can be polarized.	6 Marks	L2	CO3	PO2

UNIT-IV

7.	a)	Starting from the equivalent circuit, derive the transmission line equation for V and I in terms of the source parameters and prove that $\mathbf{Z_o^2 = Z_{sc}\,Z_{oc}}$	6 Marks	L2	CO4	PO2
	b)	Find the input impedance of a 75Ω lossless transmission line of length 0.2λ, if it is terminated in a short circuit.	6 Marks	L3	CO4	PO2
		(OR)				

8.	a)	Derive an expression for the relation between reflection coefficient, load and characteristic impedance.	6 Marks	L1	CO4	PO2
	b)	A lossy line which has $R = 2.5\ \Omega$ /m, $L = 1.0$ mH/m, $C = 1$ pF/m, and $G = 0$ operates at $f = 1.5$ GHz. Find the attenuation constant of the line.	6 Marks	L3	CO4	PO1

UNIT-V

9.	a)	List out the various applications of a Smith chart.	6 Marks	L1	CO4	PO1
	b)	A lossless transmission line is terminated in a load impedance of $30 - j\,25\Omega$. Find the phase constant and the reflection coefficient of a line of length 50m. Characteristic impedance $z_0 = 50\ \Omega$. Wavelength on the line = 0.40m.	6 Marks	L3	CO4	PO2

(OR)

10.	a)	Explain how single stub matching is carried out using a Smith chart.	6 Marks	L2	CO4	PO2
	b)	Find the input impedance of a 75Ω lossless transmission line of length 0.2λ. if it is terminated in an open circuit using Stub matching.	6 Marks	L4	CO4	PO3

❁ ❁ ❁