K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
SESSION: 2023-2024 (EVEN SEMESTER)

FIRST ASSIGNMENT

Degree	:	**B.E**	**Semester**	:	**IV**
Branch	:	**ECE**	**Course Code**	:	**BEC401**
Course Title	:	**ELECTROMAGNETIC THEORY**	**Max Marks**	:	**25**
Date	:	**11/05/2024**	**Last Date for submission**	:	**21/05/2024**

Q No.	Question	Marks	K-Level	CO mapping
1	a) **Compute** cylindrical and spherical coordinates for the point P(3,4,5). Also write the equations for differential length, differential surface, differential volume for rectangular, cylindrical and spherical systems.	5	**Applying (K3)**	CO1
	b) State and **Explain** coulombs law of force between N-point charges in vector form.		**Understanding (K2)**	
	c) Four10nC positive charges are located in the Z=0 plane at the corners of square 8cm on a side. A fifth 10nC positive charge is located at a point 8cm distance from the other charges. **Find** the magnitude of total force on this fifth charge for $\epsilon = \epsilon_0$.		**Applying (K3)**	
2	a) Point charges of 20nc each are located at A(2,0,0), B(-2,0,0), C(0,2,0) & D(0,-2,0). **Find** the total force on charge at Point A and also find electric field at A.	5	**Applying (K3)**	CO1
	b) The Three vertices of a triangle are located at A(6,-1,2), B(-2,3,-4) & C(-3,1,5). **Determine** i) R_{AB} x R_{AC} ii) Area of Triangle		**Applying (K3)**	
	c) **Find** electric flux density in RCS at point P(6,8,-10) due to i) A point charge of 40mc at the origin ii) A uniform line charge of ρ_L=40μC/m on the z-axis & iii) A uniform surface charge of density ρ_S=57.2μC/m^2 on the plane x=12m		**Applying (K3)**	
3	a) **Derive** an expression for electric field intensity due to infinite line charge.	5	**Applying (K3)**	CO1
	b) **Interpret** Coulombs law to find the relation between charges Q1 and Q2 such that force on unit positive charge at (-2,3,0) have (i) No x-component (ii)No y-component. Two point charges Q1 and Q2 are located at (3,7,0)m and (4,0,0)m.		**Applying (K3)**	

	c) **Find** the total charge within each of the indicated volumes. i) $\rho_v = \rho^2 z^2 \sin(0.6\phi)$; $0 < \rho < 0.1$, $0 < \phi < \pi$, $2 < z < 4$ ii) Universe: $\rho_v = e^{-2r}/r^2$		**Applying (K3)**	
4	a) **Derive** Gauss's Law in integral form with its statement.	5	**Applying (K3)**	CO2
	b) Given, $D = \frac{\rho^2 z^2}{3}\cos\phi\hat{a}_\phi$. **Find** flux crossing $\phi = \frac{\pi}{4}$ half plane defined by $0 \le \rho \le 3, 2 \le z \le 4$.		**Applying (K3)**	
	c) Starting from Del Operator, **Derive** maxwell's first equation.		**Applying (K3)**	
5	a) State and **Prove** Divergence theorem.	5	**Applying (K3)**	CO2
	b) **Evaluate** both sides of Gauss's Divergence theorem for $\vec{D} = 2xyz\,\hat{a_x} + 3y^2z\,\hat{a_y} + x\,\hat{a_z}$, -1< x, y, z<+1		**Applying (K3)**	
	c) **Find** divergence of $\vec{D} = (2xyz - y^2)\hat{a_x} + (x^2z - 2xy)\hat{a_y} + x^2y\hat{a_z}$ $atP\ (2,3,-1)$		**Applying (K3)**	

Course Incharge

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SECOND ASSIGNMENT

Degree : B.E		**Semester**	: IV
Branch : ECE		**Course Code**	: BEC401
Course Title : ELECTROMAGNETIC THEORY		**Max Marks**	: 25
Date : 19/6/2024		**Last Date for submission**	: 03/07/2024

Q No.	Question	Marks	K-Level	CO mapping
1	a) **Derive** an equation for Energy expended in moving a point charge in an electric field.	5	Applying (K3)	CO2
	b) **Derive** point form of current continuity equation.		Applying (K3)	CO2
	c) Given that $\vec{J} = 10\rho^2 Z\hat{a}_\rho - 4\rho\cos^2\Phi\hat{a}_\Phi mA/m^2$. **Find** total current flowing outward through circular band ρ=3, $0 < \Phi < 2\pi$, $2 < Z < 2.8$		Applying (K3)	CO2
2	a) **Find** the Work done in carrying a 6C of charge from A(1.8.5) to B(2,18.6), If $\vec{E} = -8xy\hat{a}_x - 4x^2\hat{a}_y + \hat{a}_z$ V/m along the path y = 3x+2, z = x+4	5	Applying (K3)	CO2
	b) **Determine** total current & volume charge density if velocity is 2×10^6 m/s at z=0.1m. Given $\hat{J} = -10^6 Z^{1.5}$ at Z direction in $0<\rho<20\mu m$. Also if charge density is -2000 C/m^3 at Z = 0.15m, obtain charge velocity at that point.		Applying (K3)	CO2
	c) **Derive** for Line integral with respect to work done in different paths.		Applying (K3)	CO2
3	a) State and **Prove** Poisson's and Laplace equation.	5	Applying (K3)	CO3
	b) **Determine** Capacitance of Two concentric spheres using Laplace Equation.		Applying (K3)	CO3
	c) **Find** V, $\vec{E}$, Q and C for which Conducting spherical shells with radii a = 10cm & b = 20cm are maintained at a potential difference of 80V such that V=0 at r = b & V=80V at r = a, and relative permittivity = 3.5		Applying (K3)	CO3
4	a) **Determine** $\vec{E}$ at P(3,1,2) for the field of 2 Co-axial Conducting Cylinders V=50V at ρ = 2m , V=20V at ρ = 3m	5	Applying (K3)	CO3
	b) **Find** the incremental field strength at P2 due to the current element of $2\pi\hat{a}_z \mu A.m$ at P1. The coordinates of P1 and P2 are (4,0,0) and (0,3,0) respectively.		Applying (K3)	CO3
	c) **Derive** Biot-Savart Law and Ampere Circuital Law for magnetic field with its statement.		Applying (K3)	CO3

5	a) **Evaluate** stokes theorem for $\bar{H} = 6xy\hat{a}_x - 3y^2\hat{a}_y$. 2<x<5, -1<y<1, z=0. Let the positive direction of "ds" be Z.	5	Applying (K3)	CO3
	b) **Determine** whether following equations satisfies Laplace equations i) $V = 2x^2 - 3y^2 + z^2$ ii) $V = r^2\cos\Phi + \theta$		Applying (K3)	CO3
	c) **Find** numerical values for V and ρ_v at point P in free space if i) $V = \frac{4yz}{x^2+1}$ at $P(1,2,3)$ ii) $V = 5\rho^2\cos 2\Phi$ at $P(3,60°,2)$		Applying (K3)	CO3

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Activity

Degree	:	**B.E**	**Semester**	:	**IV A & B**
Branch	:	**ECE**	**Course Code**	:	**BEC401**
Course Title	:	**Electromagnetic Theory**	**Max Marks**	:	**25**
Date	:	**23/7/2024**	**Last Date for submission**	:	**30/7/2024**

Q No.	Question	Marks	K-Level	CO mapping
1	**Build** force on a differential current element with equations	5	Applying (K3)	CO4
2	**Construct** force between differential current elements with neat diagrams and equations	5	Applying (K3)	CO4
3	**Derive** Maxwell's equations in static field	5	Applying (K3)	CO4
4	**Build** Poynting's Theorem with its statement	5	Applying (K3)	CO5
5	**Derive** General Wave equations in electric and magnetic field for freespace	5	Applying (K3)	CO5
	OR			
6	**Derive** equations for Magnetic circuits with suitable diagram	5	Applying (K3)	CO4
7	**Build** magnetic boundary conditions with neat diagram	5	Applying (K3)	CO4
8	**Derive** Maxwell's equations in time varying field	5	Applying (K3)	CO4
9	**Obtain** the solution of wave equation for uniform plane wave in freespace	5	Applying (K3)	CO5
10	**Build** equations for skin depth and loss tangent	5	Applying (K3)	CO5

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