Bundelkhand Institute of Engineering & Technology, Jhansi,

Class Test- 1

Class (Yr&Branch): 2nd(EE)Semester: 3rd

Subject:EMFT

Time: 60 Minutes **M.M.: 10**

Student's Name..... **Roll No.....**

Attempt all questions **(4X2.5=10)**

1. Using Stoke's theorem, prove that curl grad $\Phi = 0$
2. Given $A = (5r^2/4)\, a_r$ in a spherical coordinate. Verify divergence theorem for the volume enclosed between r=1 and r=2.
3. An electric field E is given as $E = 6x^2\, a_x + 6y\, a_y + 4a_z$
   Find V_{AB} if point A and B are specified by A(2,6,-1) and B(-3,-3,2).
4. A charge of -0.3Ω C is located at A (25,-30,15)cm and a second charge of 0.5 ΩC is at B(-10,8,12)cm. Find E at point P(15,20,50).

Bundelkhand Institute of Engineering & Technology, Jhansi.

Class Test- 2

Class (Yr&Branch): 2nd(EE) Semester: 3rd
Subject: EMFT
Time: 60 Miautes M.M.: 10
Student's Name..... **Roll No.....**

Attempt any 4 questions **(4X2.5=10)**

1. State and explain Biot-savart's law?
2. Find the magnetic field intensity due to co-axial cable?
3. Find magnetic field intensity due to solenoid carrying current I and having length L= 4m?
4. Define Magnetic dipole moment? And Write Lorentz force equation?
5. What is the energy stored in a capacitor made of two parallel metal plates each of 30 cm2 area separated by 5mm in air. ε o= 8.854x10-12. The capacitor is charged to potential difference of 500v?
6. A conductivity of a wire is 5000 mho/m and it is subjected to an electric field of 0.1 volts/m. Then what is the current density (J) in a wire?

Bundelkhand Institute of Engineering & Technology, Dept.-Electrical Engineering
Class Test-II Sub-Electromagnetic Field Theory (KEE-301)

Maximum marks: 15 **Duration: 1Hr**

Note: Attempt all questions Each question is of 5 marks

Q1. (a) Derive the relation between electric field and potential difference. Find potential in all regions due to point charge 'Q' at origin. **CO2**

'Or'

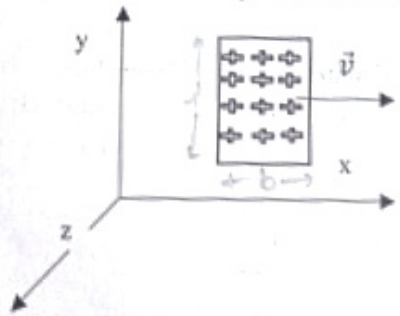
(b) A charge 'Q' is placed at origin, potential due to which at A (2, 0, 0) is 15V and at point B (0.5, 0, 0) is 30V. Find potential (V) at C (1, 0, 0). **CO2**

Q2. (a) Find magnetic field intensity $\vec{H}$ at the centre of a Hexagon loop of side length L, and carrying current I in anticlockwise direction. **CO2**

'Or'

(b) Why electrical charges can be, and magnetic poles cannot be separated, explain? Which among electrical and magnetic field is 'solenoidal'. Hint: Use Gauss law to explain. **CO2**

Q3. Find magnetic flux density $\vec{B}$ along positive Z-axis for the figure below. The surface charge density is given as 'σ'(C/m^2), and the sheet is moving with velocity 'V' along positive X-axis. **CO2**



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KEE-301

(Roll No. to be filled by candidate)									
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B. TECH.
THIRD SEMESTER THEORY EXAMINATION, 2021-22
KEE-301
ELECTROMAGNETIC FIELD THEORY

Time: 03 Hours **Max. Marks: 100**

Note:
- Attempt all questions. All questions carry equal marks.
- Assume missing data suitably.

1.	Attempt any ***TWO*** parts of the following:	2×10	CO
a.	Given $\vec{A} = xy\hat{i} + yz\hat{j} + zx\hat{j}$, find $\int \vec{A}.\vec{ds}$ for the surface $0 \le x \le 2$, $0 \le y \le 2$, $0 \le z \le 2$ using divergence theorem.		CO1
b.	Given points P (1, -3, 5), Q (2, 4, 6) and R (0, 3, 8), find (a) The position vectors P Q and R with respect to origin (b) Vector $\overrightarrow{PQ}$, $\overrightarrow{QR}$ and $\overrightarrow{RP}$ (c) Scalar product for all combinations of vector $\overrightarrow{PQ}$, $\overrightarrow{QR}$ and $\overrightarrow{RP}$ (d) Vector product for all combinations of vector $\overrightarrow{PQ}$, $\overrightarrow{QR}$ and $\overrightarrow{RP}$ (e) Angle between vector $\overrightarrow{PQ}$, $\overrightarrow{QR}$ and $\overrightarrow{QR}$ and $\overrightarrow{RP}$.		CO1
c.	Write in brief about Gradient, Divergence, Curl and Laplacian.		CO1
2.	Attempt any ***TWO*** parts of the following:	2×10	CO
a.	Using Gauss' law, find electrical field intensity $\vec{E}$ in all regions due (a) Uniformly charged non-conducting sphere of radius R		CO 2

and having volume charge density $\rho_v(\frac{C}{m^3})$.

(b) Infinite long line having $\rho_l(\frac{C}{m})$, line charge density on z-axis.

b. A charge 'Q' is placed at origin, potential due to which at A (2, 0, 0) is 20V and at point B (0.5, 0, 0) is 35V. Find potential (V) at (3, 0, 0). CO2

c. Deduce the relationship between electric field intensities $\vec{E}1$ and $\vec{E}2$, electric flux densities $\vec{D}1$ and $\vec{D}2$, of two isotropic, homogenous mediums with dielectrics ε_1 and ε_2. Separated by a boundary, having surface charge density $\rho_s(\frac{C}{m^2})$. CO2

3. Attempt any ***TWO*** parts of the following: 2×10 CO

a. Explain following in brief CO3

(1) Biot-savart's law.

(2) Ampere's law.

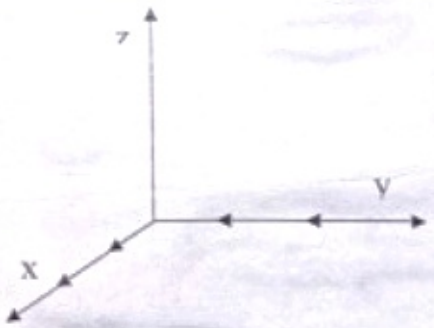
(3) Gauss' law of magnetic field.

(4) Maxwell's equation for static magnetic.

(5) Magnetic flux density.

b. Find magnetic field intensity $\vec{H}$ at the center of a square loop of side length L, and carrying current I in anticlockwise direction. CO3

c. Infinite length conductor along Y, X-axis carries current of 8Amp, as shown below. Find magnetic field intensity $\vec{H}$ at (3, 4, 0). CO3



4. Attempt any ***TWO*** parts of the following: 2×10 CO

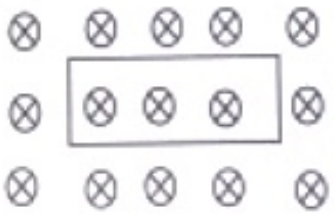
a. If two parallel conductors of infinite length, seperated by a distance 'd' carrying current I_1 and I_2. Find force per unit length between them for I_1 and I_2 in same and, I_1 and I_2 opposite direction. CO4

b. Find the inductance of a co-axial cable, between $\rho = a$ and $\rho = b$ for height 'H'. CO4

c. Given that $\vec{H}_1 = -2a_x+6a_y+4a_z$ A/m in region $y - x \leq 0$, where $\mu_1 = 5\mu_0$, calculate $\vec{H}_2$ and $\vec{B}_2$ in region $y - x \geq 0$, where $\mu_2 = 2\mu_0$. CO4

5. Attempt any ***TWO*** parts of the following: 2×10 CO

a. Calculate the power dissipated in watts for the given loop of resistance 0.5 ohm, for B=0.5sin100t T. length and width of the loop is 10cm and 5cm respectively. CO5



b. An electric field in free space is given by $\vec{E} = 50\cos(10^8 t + \beta x)\, a_y$ V/m CO5

(a) Find the direction of wave propagation

(b) Calculate β and the time taken to travel a distance of half wavelength

(c) Sketch the wave at t = 0, T/4, and T/2.

c. Deduce the expressions of **E(z, t)** and **H(z, t)** for lossy dielectric medium. CO5

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(Roll No. to be filled by candidate)

B. TECH.

THIRD SEMESTER THEORY EXAMINATION, 2022-23

KEE-301

ELECTROMAGNETIC FIELD THEORY

Time: 03 Hours **Max. Marks: 100**

Note: Attempt all questions. All questions carry equal marks. Assume missing data suitably.

1. Attempt any ***FOUR*** parts of the following: 4×5=20 CO

a. Transform the following vector to spherical coordinates. The vector $A = 5\hat{a}_x$ and point = ($r=4$, $\theta=25^\circ$, $\phi=120^\circ$). CO1

b. If $S = S(x,y,z) = x^2 - x^2 y + x y^2 z^2$, then find the value of grad S at the point (2,-1,-3). CO1

c. Determine the divergence of the vector field $A = \rho z \sin\phi \hat{a}_\rho + 3\rho z^2 \cos\phi \hat{a}_\phi$ at point $(5, \pi/2, 1)$. CO1

d. Given $A = (10 \rho^3)/4 \hat{a}_\rho$ in cylindrical coordinate system. Verify Gauss theorem of divergence for the volume enclosed by $\rho = 2$, $z = 0$, to 10. CO1

e. Using Stoke's theorem, prove that curl grad $\phi = 0$ CO1

f. Define the convergence, divergence and curl of a vector. CO1

2. Attempt any *TWO* parts of the following: 2×10=20 CO

a. (i)An electric field E is given as $E = 6 x^2 \hat{a}_x + 6 y \hat{a}_y + 4 \hat{a}_z$. Find V_{AB} if points A and B are specified by A(2,6,-1) and B(-3,-3,2). CO2

(ii)Write down applications of the Gauss's Law.

b. Find the total electric field intensity at point (0,6,5)m due to a charge 20μC located at (2,0,6)m, a charge of 60 μC located at (0,-1,2)m and a charge 100 μC located at (2,3,4)m. CO2

c. (i)What is equipotential surface? Give two examples. CO2

(ii)Explain energy stored and energy density in static electric field.

3. Attempt any *TWO* parts of the following: 2×10=20 CO

a. Consider volume current density distribution in cylindrical coordinate as CO3

$J(\rho, \phi, z) = 0 \quad 0<\rho<a$

$J(\rho, \phi, z) = J_0 \{\rho/a\} \hat{a}_z \quad a<\rho<b$

$J(\rho, \phi, z) = 0 \quad b<\rho<\infty$

Find the magnetic field intensity H in various regions.

b. (i)State and explain Biot-Savart's law. CO3
(ii)Apply Biot-Savart's law to calculate magnetic field of a circular current carrying loop.

c. (i)State and explain Ampere's law both in integral and differential forms as used in magnetic fields. CO3
(ii)Find magnetic field at a distance R from a long straight wire carrying a steady current using Ampere's law.

4. Attempt any *TWO* parts of the following: 2×10=20 CO

a. Two different current elements $I_1\ dl_1 = 3\times10^{-6}\ \hat{a}_y$ A.m. at $P_1(1,0,0)$ and $I_2\ dl_2 = 3\times10^{-6}\ (-0.5\ \hat{a}_x + 0.4\hat{a}_y + 0.3\hat{a}_z)$ A.m. at P(2,2,2) are located in free space. Calculate the vector force exerted on $I_2\ dl_2$ by $I_1\ dl_1$. CO4

b. Define: CO4
(i) Magnetic dipole and magnetic dipole moment.
(ii) Intensity of magnetization (M)
(iii) Magnetic induction (B)

c. Derive a relation between magnetizing current density (J_m) and intensity of magnetization (M). CO4

5. Attempt any *TWO* parts of the following: 2×10=2 CO

a. (i)What are transmission lines? Explain different types of transmission lines. CO5
(ii)Define propagation constant and phase velocity.

b. Define characteristic impedance. Derive the expressions of characteristic for lossless and distortionless lines. CO5

c. What is Smith chart? What are its applications? CO5