Enrollment No: _____ Exam Seat No: _____

C.U.SHAH UNIVERSITY
Winter Examination-2018

Subject Name: Electromagnetics

Subject Code: 4TE06ELM1 **Branch: B.Tech (Electrical)**

Semester: 6 **Date: 19/10/2018** **Time: 02:30 To 05:30** **Marks: 70**

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

1) Avector indicates both magnitude and direction. Determine whether the given statement is true or false.

2) Points **P** and **Q** are located at **(1, 2, -3)** and **(-4, 0, 5).** Calculate the distance between **P** and **Q**.

3) Give any two examples of a scalar and a vector.

4) If A is a vector, then A$\times A = A^2$. Determine whether given statement is true or false.

5) Give the types of co-ordinate system.

6) Find the magnitude of the vector $\vec{A} = 3\vec{a}_x + 4\vec{a}_y + 5\vec{a}_z$

7) If Aand B are the vectors, then A .B= B.A. Determine whether the given statement is true or false.

8) Gauss Law is applicable to only closed surface. Determine whether the given statement is true or false.

9) What is the unit of magnetic permeability?

10) Find the cosine angle between $2a_x$ and $-a_x + 2a_y + 7a_z$?

11) What is the unit of electric field intensity?

12) For any vector A unit vector $\vec{a}_A.\vec{a}_A$=_____

13) If A and B are the vectors, then $A \times B = B \times A$. Determine whether the given statement is true or false

14) Find the cylinindrical coordinates from given cartesian co-ordinates P(-2, 6, 3).

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

(a) Determine the force between two charges $-3\times10^{-4}C$ at P(1,2,3) and $10^{-4}C$ at Q (2,0,5) in a vaccum. **07**

(b) If Q_1 and Q_2 are the point charges are located at points having position vectors $\vec{r}_1$ and $\vec{r}_2$, derive the equation of force $\vec{F}_{12}$ on charge Q_2 due to Q_1. **07**

Q-3 **Attempt all questions** **(14)**

(a) Given the vectors $\vec{M} = -10\vec{a}_x + 4\vec{a}_y - 8\vec{a}_z$ and $\vec{N} = 8\vec{a}_x + 7\vec{a}_y - 2\vec{a}_z$.Find **07**

i) A unit vector in the direction of $-\vec{M} + 2\vec{N}$.

ii) The magnitude of $\vec{N} - 3\vec{M}$.

(b) Derive the equation for electric field intensity $\vec{E}$ for a finite line charge with a uniform charge density ρ_L. **07**

Q-4 **Attempt all questions** **(14)**

(a) Derive the equation for electric flux density $\vec{D} = \frac{Q}{4\pi r^2}\vec{a}_r$, where Q is the point charge. **07**

(b) If **A** and **B** are the vectors, explain its dot product and cross product operation. **07**

Q-5 **Attempt all questions** **(14)**

(a) Derive the equation for magnetic field intensity with the help of Bio-Savart's law. **07**

(b) Derive the equation of force $\vec{F} = Id\vec{L} \times \vec{B}$, where $d\vec{L}$ =Length of differential element, $\vec{B}$ =magnetic flux density, I= current through differential element **07**

Q-6 **Attempt all questions** **(14)**

(a) The field quantities are given by **07**

$\vec{P} = 2\vec{a}_x - \vec{a}_z$

$\vec{Q} = 2\vec{a}_x - \vec{a}_y + 2\vec{a}_z$

$\vec{R} = 2\vec{a}_x - 3\vec{a}_y + \vec{a}_z$

Determine i) $(\vec{P}+\vec{Q})\times(\vec{P}-\vec{Q})$ ii) $\vec{Q}.\vec{R} \times \vec{P}$

(b) Express the DEL (∇) operator in Cartesian and Circular cylindrical co-ordinates. **07**

Q-7 **Attempt all questions** **(14)**

(a) For a co-axial cable at high frequencies, give the equation for capacitance, conductance, inductance and resistance. **07**

(b) $\vec{A} = 2\vec{a}_x + \vec{a}_y - 3\vec{a}_z$, $\vec{B} = \vec{a}_y - \vec{a}_z$, $\vec{C} = 3\vec{a}_x + 5\vec{a}_y + 7\vec{a}_z$, Determine **07**

i) $\vec{A} - 2\vec{B} + \vec{C}$

ii) $\vec{C} - 4(\vec{A} + \vec{B})$

Q-8 **Attempt all questions** **(14)**

(a) Explain position vector and distance vector. **07**

(b) Find the gradient of the following scalar fields: **07**

i) $U = x^2 y + xyz$ ii) $V = pz\sin\phi + z^2\cos^2\phi + \rho^2$