Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2019

Subject Name: Electromagnetics
Subject Code: 4TE06ELM1 **Branch: B.Tech (Electrical)**
Semester: 6 **Date: 16/04/2019** **Time: 10:30 To 01:30** **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)**

a) Electric field intensity is a quantity
(A) scalar (B) vector (C) both (a) and (b)

b) If A and B are the vectors, then A × B= B × A
A) True B) False

c) If ρ is a variable of Cylindrical co-ordinates, x and y are Cartesian co-ordinates, then
(A) $\rho = x + y$ (B) $\rho = x - y$ (C) $\rho = \sqrt{x^2 + y^2}$

d) Points P and Q are located at P (10,2,4) and Q (-3,1,5) then distance between P and Q is ___
A) 13 B) 5.2 C) 0 D) 10

e) Gauss Law is applicable to _____
A) Open surface B) Open and Closed Surface C) Closed Surface D) None of the above

f) The relative permittivity has the following units
(A) F/m (B) m/F (C) Wb/m (D) no units

g) If A is a vector, then_____
A)A.A =1 B)A.A=0 C)A.A=A^2 D)A.A=A

h) The magnitude of vector A = 2 cos α a_x + 2 sin α a_y+ 7a_z =_____
(A) 10 (B) 0 (C) 3.87 (D) 7.28

i) Electric field lines exerting force on a charge are also known as
(A)force of lines (B)lines of force (C)force lines (D) both a and b

j) The unit of electric field intensity is _____
(A) Coulomb/Newton (B) Coulomb (C) Newton (D) Newton/Coulomb

k) The equation for a line charge is given by_____
(A) $\int \rho_L dl$ (B) $\int \rho_V dv$ (C) $\int \rho_s ds$

l) If Q is the charge in a total volume v, then volume charge density ρ = ____
(A) Q/V (B) V/Q (C) Q (D)Q.V

m) Law stating force directly proportional to charges and inversely proportional to square of radius is called
(A) Newton's law (B)coulombs law (C)gauss's law (D)Ohm's law

n) Curl of H =_____
(A) ∇H (B) $\nabla * H$ (C) $H\nabla$ (D) ∇ H^2

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

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

(a) **(07)**

If $\vec{A} = 10\vec{a}_x - 4\vec{a}_y + 6\vec{a}_z$, $\vec{B} = 2\vec{a}_x + \vec{a}_y$,

Find (1) The component $\vec{A}$ along $\vec{a}_y$ (2) The magnitude of $3\vec{A} - \vec{B}$ (3) A unit vector along $\vec{A} + 2\vec{B}$.

(b) Find D at (4, 0, 3) if there is a point charge -5π mC at (4, 0, 0) and a line charge 3π mC/m along the y axis. **(07)**

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

(a) **(07)**

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.

(b) **(07)**

If $\vec{A}$ is a vector, give the equation for vector $\vec{A}$ in circular cylindrical co-ordinates. Give the relationship between Cartesian co-ordinates (x,y,z) and cylindrical co-ordinates $(\rho, \emptyset, z)$.

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

(a) Derive Poisson's and Laplace equation. **(05)**

(b) Explain difference between Electric and magnetic field. **(04)**

(C) Two dipoles with dipole moments -5 a_z nC/m and 9 a_z nC/m are located at points (0,0,-2) and (0,0,3) respectively. Find the potential at the origin. **(05)**

Q-5 **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) Explain position vector and distance vector. **(07)**

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

(a) **(07)**

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

(b) Derive the equation for magnetic field intensity with the help of Biot-Savart's law. **(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) State Gauss Law. Show that electric flux $\psi = \oint D_S \, dS$ = Q, where Q= point charge and D_S = surface Flux density. **(07)**

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

(a) Explain Antenna characteristics of power gain. **(07)**

(b) The radiation intensity of a certain antenna is **(07)**

$U(\theta, \emptyset) = 2 \sin\theta \sin^3 \emptyset$, $0 \le \theta \le \pi$, $0 \le \emptyset \le \pi$

$= 0$, elsewhere