Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech.Winter-2019 - 20Examination

Semester: 5 **Date: 26/11/2019**
Subject Code: 03107302 **Time: 10:30am to 01:00pm**
Subject Name: Electromagnetic Theory **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (All are compulsory) (Each of one mark) **(15)**

1. The divergence of curl of any vector is _____.
2. _____ states that the total electric flux Ψ through any closed surface is equal to the total charge enclosed by that surface.
3. The result of dot product $a_y \cdot a_\theta$ is _____.
4. The Biot-savart's law is a general modification of _____ law.
5. The unit of capacitance is_____.
6. Points P and Q are located at (0, 2, 4) and (- 3 , 1, 5). Calculate distance between P and Q.
7. The plane y = 3 m contains a uniform charge distribution with density $\varrho_s = 10^{-8}/6\pi$ C/m^2. Determine E at y = 4.37 m.
8. The electric field intensity at a point can be defined as a force exerted on unit positive charge. (True or False)
9. "The work done is depends on the path selected in electrostatic field." (True or False)
10. Give the statement of uniqueness theorem.
11. Which of these is correct relationship ?

    [a] A x A = $|A|^2$ [b] A x B + B x A = 0

    [c] A . B . C = B . C . A [d] $a_x \cdot a_y = a_z$
12. The value of E within the field due to a point charge can be found with the help of_____.

    [a] Faraday's law [b] Kirchhoff's law

    [c] Coulomb's law [d] all of above
13. At Cartesian point (- 3, 4, - 1), which of these is incorrect?

    [a] ϱ = - 5 [b] r = $\sqrt{26}$

    [c] $\theta = \tan^{-1}\frac{5}{-1}$ [d] $\Phi = \tan^{-1}\frac{4}{-3}$
14. A capacitor stores 0.24 coulombs at 10 volts. Its capacitance is _____ .

    [a] 0.024 F, [b] 0.12 F,

    [c] 0.6 F, [d] 0.8 F
15. A positive divergence for any vector indicates _____ .

    [a] a sink, [b] an electric flux density

    [c] a source [d] a volume charge density

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Derive Poisson's and Laplace's Equation.

B) Find Electrical field intensity due to infinite line with uniform line charge density ρ_L on z-axis.

C) Transform the given vector G = (xz/y) a_x in to spherical co-ordinates.

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

Q.3 A) Given points E (2, 5, 1), F (-1, 4, -2) and G (3, -2, 4). **(07)**

Find : (i) A unit vector directed from E towards F.

(ii) The angle between R_{EF} and R_{EG}.

(iii) The scalar projection R_{EF} and R_{EG}.

B) Explain Ampere's circuital law. Also derive necessary expression for H at any point due to a coaxial cable. **(08)**

OR

B) Given the electric flux density, D = 0.3r^2 a_r nC/m^2 in free space : **(08)**

(i) Find E at point P (2, 25°, 90°);

(ii) Find the total charge within the sphere r = 3;

(iii) Find total electric flux leaving the sphere r = 4.

Q.4 A) Explain Dot product and Cross product in detail. **(07)**

OR

A) Find the magnitude of the electric field intensity in a sample of silver having σ = 6.17 x 10^7 mho/m and μ_e = 0.0056 m^2/V. if **(07)**

(a) the drift velocity is 1 mm/s,

(b) the current density is 10^7 A/m^2,

(c) the sample is a cube, 3 mm on a side, carrying a total current of 80A,

B) Enlist all four Maxwell's equations in point form and starting from Gauss law derive the Maxwell's equation $\nabla \cdot D = \rho_v$. **(08)**