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[4857]-168A**S.E. (Electronics/E & TC) (II Sem.) EXAMINATION, 2015****ELECTROMAGNETICS****(2008 PATTERN)****Time : Two Hours****Maximum Marks : 50**

N.B. :- (i) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4,
Q. No. 5 or Q. No. 6.

(ii) Answer *all* questions in same answer-book.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Figures to the right indicate full marks.

(v) Assume suitable data, if necessary.

(vi) Use of calculator is allowed.

1. (a) What is an electric dipole ? Derive the expression for electric field at distant point due to electric dipole. [8]
- (b) Determine 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 [8]

Or

2. (a) State and prove vector form of Gauss's law. [5]

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- (b) Find the electric field intensity due to an infinite line charge at an arbitrary point using Gauss's law. [5]
- (c) Verify whether the potential fields given below satisfy Laplace's equation : [6]
- (i) $V = 4x^2 - 6y^2 + 2z^2$
- (ii) $V = r \cos \phi + 4z$.
3. (a) Applying Biot-Savart's law, find the expression for magnetic field intensity due to finite length current filament. [8]
- (b) A dielectric-free space interface has the equation $3x + 2y + z = 12$ m. The origin side of the interface has $\epsilon_{r1} = 3$ and $\bar{E}_1 = 2a_x + 5a_z$ v/m. Find \bar{E}_2 . [8]
- Or*
4. (a) Derive an expression of relaxation time. What is its significance ? [5]
- (b) An infinite long current filament is placed along Z-axis. The magnetic field intensity at point (3, 4, 0) is $10(-0.8a_x + 0.6a_y)$ A/m. Find the current through the filament. [5]
- (c) Find the current I through a square area 2 m on a side with edges coinciding with X and Y-axes and one corner at the origin if : [6]
- (i) $H = 2y^2 a_x$ A/m
- (ii) $H = 3x^2 y a_z$ A/m.

5. (a) State and prove Poynting theorem. Explain the significance of the terms involved. [6]
- (b) State Maxwell's equations in point and integral form for time varying fields. [6]
- (c) A capacitor has a capacitance of 2.5 pF. Find the displacement current at $t = 0$ if a voltage $10 \sin (150 \pi t)$ is applied to it. [6]

Or

6. (a) Write short notes on : [12]
- (i) Finite element method
- (ii) Method of moments.
- (b) Derive the expression for emf induced in conductor in motion through the time varying field. [6]