M.Sc. First Semester (Applied Electronics) (New) (CBS)

15004 : Electric & Magenetic Fields : 1 AE 4

P. Pages: 2

Time: Three Hours

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Max. Marks: 80

- 1. Assume suitable data wherever necessary. Notes:
 - 2. Illustrate your answer necessary with the help of neat sketches.
- Express the following vector: ١. a)

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 $B = \frac{10}{r} = \frac{10}{ar} + r\cos\theta = \frac{1}{a\theta} + \frac{1}{a\phi}$

in cartesian and cylindrical coordinate system.

The vector from the origin to point A is given as 6ax - 2ay - 4az and unit vector directed b) from origin to point B is $\left(\frac{2}{3}, \frac{-2}{3}, \frac{1}{3}\right)$. If points A and B are 10 units apart, find coordinates of point B.

OR

Define the following terms and give their physical interpretation 2. a)

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Gradient

ii) Divergence

- iii) Curl.
- A triangle is defined by three points, A(2,-5,1), B(-3,2,4) and C(0,3,1).

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b)

- $\overline{R}_{BC} \times \overline{R}_{BA}$, i)
- ii) The area of triangle; and
- iii) A unit vector that is perpendicular to the plane in which the triangle is located.
- Show that electric field intensity is negative gradient of potential. 3. a)

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- A uniform line charge of 16n C/m is located along the line defined by y = -2, z = 5. b) If $\in = \in_{\Omega}$: Find-
 - E at P(1,2,3) and
 - E at that point in the z = 0 plane where the direction of E is given by $\frac{1}{3} = \frac{2}{3} =$

OR

Evaluate both sides of Divergence theorem for the field $\overrightarrow{D} = 2xy \overrightarrow{ax} + x^2 \overrightarrow{ay} \cdot C / m^2$ and the a) rectangular parallelepiped formed by the planes x = 0 and 1, y = 0 and 2, and z = 0 and 3.

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An infinite plane has uniform charge density $\rho_s C/m^2$. Derive the expression of electric b) field intensity for this symmetric uniform sheet of charge.

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Derive the expression for magnetic field intensity at any point due to infinite current 5. a) carrying conductor.

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b) A current filament of 3ax A lies along x-axis. Find H in the cartesian components at P(-1,3,2).

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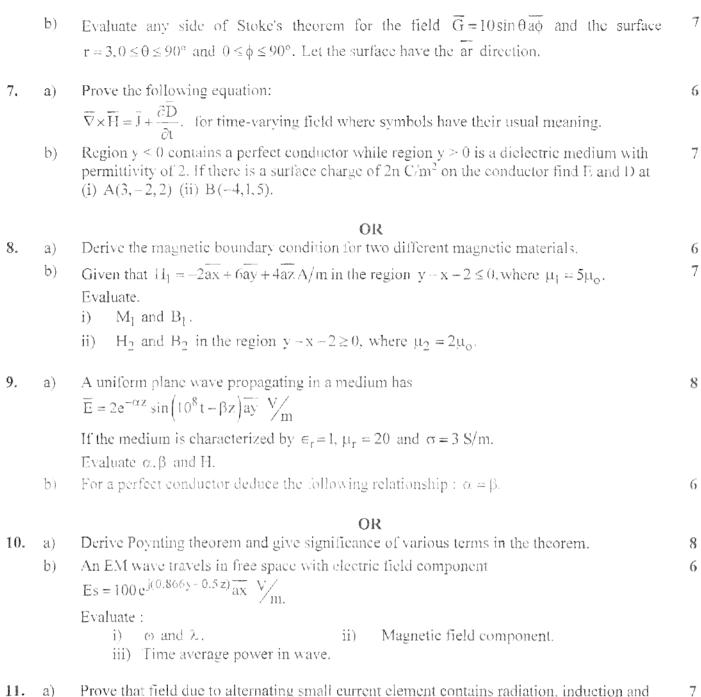
OR

6. a) Explain the following. 6

Biot-Savart's law.

Ampere's circuital law.

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- 11. a) Prove that field due to alternating small current element contains radiation, induction and the electrostatic component.
 - b) An Array of isotropic antennas is operated at frequency of 10GHz. Find null to null beam width and directivity for
 - i) Broadside array with array length 6m.
 - ii) End fire array with 20 radiators and inter element spacing of 0.5λ.

OR

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12. Assuming a sinusoidal current distribution, derive expression for field radiated by half wave dipole.

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