Total No. of Printed Pages:02

SUBJECT CODE NO:- H-538
FACULTY OF SCIENCE AND TECHNOLOGY
T.E.(EEP/EE/EEE)
Electromagnetic Fields
(REVISED)

[Time: Three Hours]   [Max.Marks:80]

Please check whether you have got the right question paper.
N.B
    i.   Que. No. 01 & Que no. 06 are compulsory.
    ii.   Attempt any two questions from remaining questions of each section.
    iii.   Assume suitable data wherever necessary.

Section A

Q.1   Attempt any five   10

a) Find $|\overline{F}|$ at point $P(-4,3,5)$ if vector field $\overline{F} = 0.4 (y - 2x) \widehat{a_x} - \frac{200}{x^2+y^2+z^2} \widehat{a_z}$.

b) State coulombs law.

c) Define electric flux density.

d) Define electric potential.

e) The two vectors given $\vec{A} = 2\widehat{ax} - \widehat{az}$ & $\vec{B} = 2\widehat{ax} - \widehat{ay} - 2\widehat{az}$ then find$(\vec{A}.\vec{B})$.

f) Define current & current density.

g) Define vector product.

Q.2   a) Transform vector $\vec{P} = 10\widehat{ax} - 8\widehat{ay} + 6\widehat{az}$ to cylindrical coordinate system at   07
point$P(10, -8,6)$.

b) Define electric field intensity & derive expression for electric field intensity due to volume   08
charge distribution.

Q.3   a) The flux density $\vec{D} = \frac{r}{3} \widehat{ar} \ nc/m^2$ is in the free space   07

    a. Find $\vec{E}$ at $r = 0.2m$
    b. Find the total electric flux leaving the sphere of $r = 0.2m$.

b) State & explain divergence theorem.   08

Q.4   a) State & explain continuity equation of current.   07

b) A current density $\vec{J} = \frac{100 \ cos\theta}{r^2+1} \widehat{ar} \ \ A|m^2$ is in the spherical coordinate system.   08
    a. How much current flows through $r = 3m$, $0 < \theta < \pi/6$ & $0 \le \emptyset \le 2\pi$.

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Q.5   a)   Define Polarization & derive the expression for polarization.   07

      b)   Derive the boundary conditions between two perfect dielectrics.   08

Section B

Q.6   Attempt any five   10

      a)   Define magnetic field intensity.
      b)   State Ampere circuital law.
      c)   State Laplace's equation for scalar magnetic field.
      d)   State Faraday's law.
      e)   Define scalar magnetic potential.
      f)   Define displacement current.
      g)   Define magnetization.

Q.7   a)   State & explain the stokes theorem.   07

      b)   Derive the expressions for boundary conditions of two different magnetic materials.   08

Q.8   a)   A point charge of $Q = -1.2C$ has velocity $\vec{\vartheta} = 5\widehat{ax} + 2\widehat{ay} - 3\widehat{az} \ m|s$. Find the magnitude of force exerted on the charge if   08
          a. $\vec{E} = -18\widehat{ax} + 5\widehat{ay} - 10\widehat{az} \quad v/m$
          b. $\vec{B} = -4\widehat{ax} + 4\widehat{ay} + 3\widehat{az} \quad T$

      b)   State & explain Faraday's law.   07

Q.9   a)   If $\vec{H}$ due to current source is given by $\vec{H} = [y\cos(\alpha x)]\,\widehat{ax} + (y + e^{x})\,\widehat{az}$. Describe the current density over the yz plane.   07

      b)   State the Maxwell's equation in differential form in magnetic field.   08

Q.10   Write short note on   15

      a)   Self & mutual inductance
      b)   Lorentz force
      c)   Permeability

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