SUBJECT CODE NO: E-215
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(EEP/EE/EEE) Examination Nov/Dec 2017
Electromagnetic Fields
(REVISED)

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

Please check whether you have got the right question paper.
N.B
i) Q.No.1 and Q.No.6 are compulsory.
ii) Attempt any two questions from Q.no.2 to Q.No.5
iii) Attempt any two questions front Q.no.7 to Q.No.10
iv) Assume suitable data wherever necessary
v) Figures to the right indicates full marks.

Section A

Q.1   Attempt any five   10

    i)   Define electric flux and Electric flux density

    ii)   Given $A = 2\,ax + 3\,ay + 6\,az$
            $B = ax - 2\,ay + 4\,az$

            Find a) A.B   b) $\bar{A} + \bar{B}$

    iii)   Find angle between vector $\bar{A} = 4ax - 2ay - az$ and $\bar{B} = ax + 4ay - 4az$

    iv)   If Co-ordinates of points P and Q are P(2, 3, -4) and Q(4, 25^0, 60^0) find distance PQ

    v)   Define the term gradient.

    vi)   Give the physical significance of divergence

    vii)   Write the expression of Differential volume and differential vector length in spherical Co-ordinate system.

    viii)   Explain what do you mean by Gaussian surface

Q.2   a) Sketch neat diagram and show incremental length, surface area and volume in cylindrical   07
           Co-ordinate system.

       b) Transfer to cylindrical co-ordinate $F = 10\,ax - 8\,ay + 6az$ at point P (10, -8, 6)   08

Q.3   a) Define electric field intensity and derive expression for electric field intensity due to infinite   08
           sheet of charge.

2017

b) Calculate the total charge within the indicated volume if   07

$e_V = 10 z^2 e^{-0.1x} \sin(\pi y)$

$-1 \le x \le 2$, $0 \le y \le 1$, $3 \le z \le 3.6$

Q.4   a) State and explain Gauss Law.   06

b) Given $D = 2xy ax + x^2 ay \; c/m^2$. Find the total charge lying within the region.   09
   $0 \le x \le 1$, $0 \le y \le 2$, $0 \le z \le 3$ by two different methods.

Q.5   a) What do you mean by potential and Potential difference ? Deduce the expression for   07
           potential difference due to system of charges.

b) For the point P(3 , 60^0, 2) in cylindrical co-ordinate and the potential field   08
   $v = 10 (\text{\textifflmath}+1)z^2 \cos \emptyset$ mts in free space. Find at point P

   a) V

   b) $\bar{D}$

   c) $\frac{dv}{dN}$

   d) aN

Section B

Q.6   Attempt any five   10
       i)   Compare self and mutual inductance

       ii)   State the properties of perfect metallic conductor

       iii)   Justify the expression $\nabla . B = 0$.

       iv)   State uniqueness theorem

       v)   State Ampere's circuital law

       vi)   What do you mean by magnetization in magnetic material

       vii)   What do you mean by displacement current and displacement current density

       viii) What do you mean by magnetic dipole & magnetic dipole moment

Q.7   a) Derive boundary conditions of the normal and tangential component of electric field at the   07
           interface of two different dielectric material.

2017

b) A current density is given by 08

$$J = \frac{100 \cos \theta}{r^2 + 1} , ar \ A/m^2$$

i) How much current flow's through the spherical cap r = 3 , $0 \leq \theta \leq \pi/6$, $0 \leq \Phi \leq 2\pi$

ii) Same current flows through the cap r = 10 , $0 \leq \theta \leq \alpha$, $0 \leq \Phi \leq 2n$ find α

Q.8 a) For the steady magnetic field show that $\nabla \times H = J$ 08

b) Find $\nabla \times G$ in cylindrical co-ordinate at P(2 , 30^0, 3) if $G = \text{S}\Phi Z$ az 07

Q.9 a) For a time varying field show that $\nabla \times E = \frac{-\partial B}{\partial t}$ 07

b) Evaluate both the sides of stokes theorem if $H = 6xy \quad ax - 3y^2 ay$ A/m and rectangular path around $2 \leq x \leq 5$, $-1 \leq y \leq 1$, z = 0 08

Q.10 Attempt any three 15

    i) Explain in detail scalar magnetic potential

    ii) Explain the term magnetic dipole moment and magnetization.

    iii) State and explain Biot savart Law

    iv) Explain nature of dielectric material.

2017