Total No. of Printed Pages:2

SUBJECT CODE:- 290
FACULTY OF ENGINEERING AND TECHNOLOGY
T.E.(EEP/EE/EEE) Examination Nov/Dec 2015
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 from Q. no 7 to Q. no 10
iv) Assume suitable data wherever necessary.

Section A

Q.1 Attempt any five 10

i) Define scalar and vector field. Give its two examples.
ii) Define electric flux and electric flux density. Write relation between E and D
iii) What is electric dipole and dipole moment state its unit.
iv) Given two points A(2,3,-1) and B ($4,25^0,120^0$) find spherical coordinates of A and cartesian coordinates of B.
v) Show that A = 4ax-2ay-az and B = ax+4ay-4az are perpendicular.
vi) Define the potential. Distinguish between potential and potential difference.
vii) The point charges Q1=30 nc, Q2=150nc. And Q.3=-70nc, are enclosed by a surface S what net flux crosses surface S.
viii) State guass law. What do you mean by guassion surface.

Q.2 a) Find the angle between A=5.8 ay+1.55az and B= - 6.93 ay+4.0az using both dot product and cross product 05
b) Transfer the following vector to cylindrical co-ordinate. F=10ax - 8ay + 6az at point P(10,-8,6) 06
c) State Coulomb's law and deduce the vector form of force between two point charges. 04

Q.3 a) Derive the expression of Electric field intensity due to infinite long & line charge of placed along z-axis. 07
b) A line charge of $2\pi nc/m$ lies along y-axis while surface charge densities of 0.1 and -0.1 nc/m^2 exists on plane z=3 and z=-4 respectively find E at (1, -7, 2). 08

Q.4 a) State and explain divergence theorem 06
b) Given $D = \frac{5r^2}{4}\ ar\ c/m^2$ in spherical co-ordinate. Evaluate both the sides of divergence theorem for the volume of sphere enclosed by r=4. 09

Q.5 a) Derive the expression for potential and elective field at any point P in free space due to electric dipole. 07
b) Given the potential field $V = x^2yz + 20y^2$ volts in free space find at point P(1,2,3) 08
i) V
ii) $\bar{E}$
iii) $\frac{dV}{dN}$
iv) D
v) Ev

SECTION-B

Q.6 Attempt any five 10

i) State continuously equation of current in integral and differential form
ii) State the properties of perfect metallic conductor
iii) Define magnetic field intensity and state its unit
iv) Define vector magnetic potential and state its unit
v) Compare self and mutual inductance
vi) State Uniqueness theorem.
vii) What is the significance of displacement current
viii) Justify the expression $\nabla . B = 0$

Q.7 a) Derive the boundary condition of the normal and tangential components of electric field at the interface of two different dielectric material 08

b) The vector current density is given by $J = \left(\frac{4}{r^2}\right) cos\theta \overline{ar} + 20e^{-2r} sin\theta \overline{a\theta} - rsin\theta cos\emptyset \bar{a}\emptyset (A/m^2)$ find the total current passing through the spherical cap r=3, $0 \leq \theta \leq 20^0, 0 \leq \emptyset \leq 2\pi$ in ar direction. 07

Q.8 a) Derive an expression for magnetic field intensity due to infinite long current carrying filament at any point P in free space 08

b) Calculate value of vector current density in cylindrical co-ordinate at point P(1.5, 90^0,0.5) if $H = \frac{2}{\varrho} \cos(0.2\emptyset) a\varrho$ 07

Q.9 a) State and explain stokes theorem 05

b) Working in cylindrical co-ordinate with the field $A = 2\varrho^2 (Z+1) sin^2\emptyset \ a\emptyset$, evaluate both sides of stokes theorem for the portion of cylindrical surface define by $\varrho = 2, \frac{\pi}{4} \leq \emptyset \leq \frac{\pi}{2}, 1 \leq 2 \leq 1.5$ and for its perioneter. Let $\overline{ds} = dsa\varrho$. 10

Q.10 Attempt any three 15

a) State Maxwell's equation in differential form
b) State and explain Amperes circuital law
c) Magnetic boundary conditions
d) Scalar magnetic potential
e) Polarization in dielectric