

FACULTY OF ENGINEERING
TE(EEP/EE/EEE) Examination - DEC - 2014
ELECTROMAGNETIC FIELD(Rev)

[Time: THREE Hours]

[Max. Marks: 80]

“Please check whether you have got the right question paper.”

- i. Question no1 & question No.6 are compulsory
- ii. Attempt any other two questions from the remaining questions of each section.
- iii. Assume suitable data. Wherever necessary.

SECTION A

- Q 1 Attempt any five (10)
- i) Find $|F|$ at $P(-4,3,5)$ if vector field $F = 0.4(y-2x)a_x - \frac{200}{x^2+y^2+z^2} \bar{a}_z$
 - ii) Given $p(6,1^0,125^0,-3)$ and $Q(3,-1,4)$ find. Distance P to Q.
 - iii) Write the expressions for differential surface areas in cylindrical co-ordinate system.
 - iv) State guass law.
 - v) What do you mean by del operator.
 - vi) Define the term electric potential
 - vii) What do you mean by electric dipole and dipole moment.
 - Viii) Give the physical significance of divergence.
- Q2 a) Define the expression for electric field intensity due to infinite sheet of charge located in $x=0$ plane (07)
- b) Give the cartesian components of the vector $H=20 a_\phi - 10a_\theta + 392$ at $P(5,2,-1)$ (08)
- Q3 a) If $\rho_v = \frac{e^{-2r}}{r^2}$ calculate the charge enclosed in the universe (07)
- b) State and explain divergence theorem. (08)
- Q4 a) Derive the expression for potential and electric field due to electric dipole. (07)
- b) Given the potential field. (08)
- $V = x^2yz + 20y^2$ volts in free space. find
- i) V at $P(1,2,3)$
 - ii) E at P
 - iii) $\frac{dV}{dN}$ at P
 - iv) a_N at P
- Q5 a) Show that at the boundary between two perfect dielectric normal components of flux densities are continuous. (07)
- b) The vector current density is given as (08)
- $$J = \left(\frac{4}{r^2}\right) \cos \theta a_r + 20e^{-2r} \sin \theta a_\theta - r \sin \theta \cos \theta a_\phi \text{ A/m}^2$$
- i) find J at $r=3, \theta=0, \phi=\pi$
 - ii) find the total current passing through the spherical cap $r=3, 0 \leq \theta \leq 20^\circ, 0 \leq \phi \leq 2\pi$

SECTION-B

- Q6 a) Attempt any five. (10)
- i) State Amperes circuital law
 - ii) What do you mean by magnetic field intensity. write its unit.
 - iii) Explain why $\nabla \cdot B = 0$
 - iv) Define displacement current density

- v) State the faraday's law
- vi) Give the unit of μ_r and \bar{M}
- vii) Define magnetic dipole moment
- viii) What do you mean by solar magnetic potential.
- Q7 a) Derive the integral and differential form of continuity equation. (07)
- b) If $H = \frac{2}{\rho} \cos(0.2\theta) a_\theta$ calculate value of vector current density. At point $(1.5, 90^\circ, 0.5)$ (08)
- Q8 a) Define the expression for magnetic field intensity in free space due to infinite long straight filament (07)
- b) A circular loop of wire of radius a lying in x - y plane with its centre at origin carries a current in $+a_\theta$ direction. Using Biot savart law find if at $(0,0,2)$ and at origin (08)
- Q9 a) Derive the boundary condition's for normal and tangential components of B and H at the interface between two different magnetic materials (07)
- b) Let $\mu_1 = 4 \mu_0$ in region 1 $Z > 0$ and $\mu_2 = 7\mu_0$ in region 2 $Z < 0$ let $K = 80 a_x$ amp/mtr. on surface $Z = 0$ (08)
- if $B_1 = 2a_x - 3a_y + a_z$ MT in region-1 find B_2
- Q10 Attempt any three (15)
- explain Maxwell's equation in integral form
 - state and explain stokes theorem
 - state and explain bio-savarts law
 - magnetization in magnetic material.