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Reg. No. : .....

Name : .....

Fourth Semester B.Tech. Degree Examination, May 2015
(2013 Scheme)
Electrical and Electronics Engineering
13.403 : ENGINEERING ELECTROMAGNETICS (E)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **(10×2= 20 Marks)**

1. What is the condition for two vectors to be perpendicular to each other ?
2. State Coulomb's law and its limitations.
3. Distinguish between scalar and vector potentials.
4. Write down the different forms of expressions for energy stored in a capacitor.
5. Define the term Dielectric strength.
6. State Ampere's cricuital law and write the relevant expression.
7. Derive Laplace's equation from Poisson's equation.
8. If $\bar{r} = xi + yi + zk$, find curl $\bar{r}$.
9. What is the difference between conduction current and displacement current ?
10. What is meant by skin depth ?

PART – B

Answer **any one full** question from **each** Module. **(4×20= 80 Marks)**

Module – 1

11. A vector field is given by the expression $\bar{F} = (1/r)\ \bar{u}_r$ in (i) spherical co-ordinates and (ii) in cylindrical co-ordinates. Determine $\bar{F}$ in each case in the Cartesian form at a point (1, 1, 1).

P.T.O.

12. a) State and prove Gauss's law. 10

    b) Derive an expression for electric field intensity due to an array of point charges. 10

Module – 2

13. a) Deduce an expression for the capacitance of a parallel plate capacitor having two dielectric media. 10

    b) The gradient of a scalar potential function ϕ is given by $\nabla \phi = 3[(x^2 - yz)i + (y^2 - zx)j + (z^2 - xy)k]$. If the point (1, 1, 1) is at zero potential determine the potential function ϕ. 10

14. State and derive the boundary conditions at the charge interface of two dielectric media.

Module – 3

15. a) State and prove Biot -Savart's law. 10

    b) Obtain the torque developed in a current carrying coil placed in a magnetic field. 10

16. a) Derive the magnetic flux density and magnetic field intensity at any point along the axis of circular coil. 10

    b) A wire carrying a current of 100 A is bent into the form of a circle of diameter 10 cm. Calculate the flux density at the centre of the coil and at a point on the axis of the coil 12 cm from it. 10

Module – 4

17. Derive Maxwell's equation in point form and integral form using Ampere's law and Faraday's law.

18. A plane traveling wave has a peak electric field intensity E as 6 kV/m. If the medium is lossless with $\varepsilon_r = 3$ and $\mu_r = 1$, find the velocity of the EM wave, peak Poynting vector, impedance of the medium and the peak value of the magnetic field H. Derive all the formulae used.