Reg. No. : .....

Name : .....

Fourth Semester B.Tech. Degree Examination, May 2013
(2008 Scheme)
Branch : Electrical and Electronics
08.403 : ENGINEERING ELECTRO-MAGNETICS (E)

Time: 3 Hours Max. Marks : 100

Instruction : *Answer **all** questions from Part **A** and **one full** question from **each** Module of Part **B**.*

PART – A

1. Find the vector projection of $\vec{A} = 2\overline{ax} + \overline{ay} - 2\overline{az}$ on $\overline{B} = 5\overline{ax} - 10\overline{ay} + 3\overline{az}$.
2. Transform the point P (4, 105°, 56°) to the other two co-ordinate systems.
3. Point charges each of value $\sqrt{4\pi\varepsilon_0}$ coulomb are located at the corners of a 3 sided polygon of side a. Find the force on each charge.
4. Calculate the capacitance per km length of an air-filled co-axial cable with inner diameter 6 mm and outer diameter 14 mm.
5. Write the forms of Laplace's equation in Cartesian, cylindrical and spherical co-ordinate systems.
6. Distinguish between scalar magnetic potential and vector magnetic potential.
7. Explain what is a standing wave if SWR is 4 find reflection co-efficient.
8. State and explain Stokes theorem.
9. State the Maxwells equations. Give the equations in differential form.
10. Define propagation constant and attenuation constant.

PART – B

Module – I

11. a) Transform the vector $\vec{F} = \gamma^{-1} \overrightarrow{a_r}$ in spherical co-ordinates to Cartesian co-ordinates. 8

b) A point charge of 100 pc is located at origin, while a uniform line charge of 5 nc/m is located at z = 3 m y = 3 m. If the plane z = 5 m also carries a charge of 5 nc/m^2. Find E at point (1, 1, 1). 12

12. a) Derive the expression for electric field intensity at a point distant 'r' from an electric dipole of dipole moment p. 10

b) Given D = $2xy\ \overline{ax} + x^2\ \overline{ay}$ c / m^2 in Cartesian co-ordinates. Verify Gauss divergence theorem for volume enclosed by $0 \leq x \leq 1$, $0 \leq y \leq 2$ and $0 \leq z \leq 3$. 10

Module – II

13. a) State and explain Biot – Savarts Law. 8

b) Three very long parallel conductors are in free space. They lie in one plane spaced by 50 cm. Each of the conductor carries a current of 100 A, so that in the first and second the current has the same direction. What is the force acting on a metre length of first, second and third conductor ? 12

14. a) A circuit carrying a current of 'I' amperes form a regular polygon of 'n' sides inscribed in a circumscribing circle of radius R. Calculate the magnetic flux density B at the centre of the polygon. 10

b) A cylindrical conductor of radius 10^{-2} m has an internal magnetic field $H = 4.77 \times 10^4 \left(\frac{\gamma}{2} - \frac{r^2}{3 \times 10^{-2}} \right) \overrightarrow{a\phi}$ A/m. What is the total current in the conductor ? 10

Module – III

15. a) State Poynting theorem. Derive Poynting theorem starting from Maxwells Equation. **10**

    b) Find skin depth, propagation constant, and velocity of propagation at a frequency of 100 MHz for aluminium with $\sigma = 36.8$ mhos / m, $\mu_r = 1$. **10**

16. a) Derive the Wave equations in free space. Show that the ratio of electric field intensity to magnetic field intensity is impedance and find its value. **10**

    b) Derive transmission line equations. **10**