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B.E / B.Tech (Part Time) DEGREE END SEMESTER EXAMINATIONS, MAY 2014

ELECTRONICS AND COMMUNICATION ENGINEERING

II Semester

PTEC9201 Electromagnetic Fields and waves

(Regulation 2009)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. State divergence theorem.
2. Plane x+2y=5 carries charge ρ_s. Find the electric field intensity **E** at (-1,0,1) .
3. State gauss law for magnetic fields.
4. A small magnet placed at the origin produces **B**= -0.5$\mathbf{a}_z$ mWb/m^2 at (10,0,0). Find **B** at (0,3,0) m.
5. In a certain material for which $\mu=6.5\mu_o$, **H**= 10$\mathbf{a}_x$+25$\mathbf{a}_y$-40$\mathbf{a}_z$ A/m find the magnetic susceptibility χ_m of the material.
6. Determine the magnetic flux density **H** for an infinitely long current carrying filament using Ampere Circuital Law.
7. Write the equation for Reluctance and Permanence.
8. Define depth of penetration.
9. Write the equation for circular and linear polarization.
10. Define surface Impedance.

Part – B (5 x 16 = 80 marks)

11. Derive the wave equation from the Maxwell's equation and explain the propagation wave in a lossy dielectric and good conductor with respect to E(z,t) and H (z,t) . (16 Marks)

12. a) (i) Derive vector magnetic potential. (10 Marks)
(ii) The vector magnetic potential is given by **A**=-$\rho^2/2$ $\mathbf{a}_z$, Wb/m, calculate the total magnetic flux crossing the surface $\varphi=\pi/2$, $1 \le \rho \le 2$ m, $0 \le z \le 5$ m. (6 Marks)

(OR)

b) (i) Find the magnetic flux density at the center of a square loop, with side *w* carrying a direct current I. (8 Marks)
(ii) Planes z=0 and z=4 carry current **K**= -10$\mathbf{a}_x$, A/m and **K** = 10$\mathbf{a}_x$ A/m, respectively .determine **H** at (1,1,1). (8 Marks)

13. a) (i) With respect to magnetic dipole moment derive the equation for Torque experienced by the rectangular loop. (8 Marks)
(ii)Derive the equation to find the force between the two current elements.(8 Marks)

(OR)

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b) (i) Consider length L of two coaxial conductors of inner radius a and outer radius b. the space between the conductors are filled with the dielectric medium with permittivity ε. Find the capacitance for this coaxial cylinders. (8Marks)

(ii) Derive the Laplace and Poisson equation. State and prove the Uniqueness theorem in the Laplace equation. (8 Marks)

14. a) (i) Derive all the four Maxwell's equation from basic law's in point form and integral forms. Show that how the Ampere's law is modified using continuity equation. (16 Marks)

(OR)

b) Derive the boundary condition for the electric field intensity **E** and electric flux density **D** for the interface between the medium of conductor and dielectric. (16 Marks)

15. a) write short notes on (i) magnetic separator (8 Marks)
(ii) Ink jet printer (8 Marks)

(OR)

b) Explain the procedure in solving the numerical problems using FDM. (16Marks)