KUMARAGURU
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Register Number:……..

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2009)

Fourth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U13ECT404**:** Electromagnetic Fields

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Columb law gives the relation between =
   a) Force b) Acceleration
   c) Force and Acceleration d) Force and charge
2. The net flux that crosses a surface S is ---------- if the suface includes the the three charges Q1= 30 nc , Q2= -70 nc, Q1= 150 nc .
3. Vector product of magnetic moment and magnetic flux density is ----------
4. Find the field intensity H if B is 6 л x 10^{-6} testla in free space
   a) 4.5A/m b) 1.5A/m
   c) 5.5A/m d) 7.0A/m
5. Magnetic material with μ_r >1 is known as ------
6. Energy stored in the inductor with the inductance of 100m H ,and current of 2A flowing through is------
   a) 400mJ b) 200mJ
   c) 800mJ d) 600mJ
7. Point form of maxwell's first equation is
   a) $\nabla x \vec{H} = \vec{J} + (\partial \vec{D} / \partial t)$ b) $\nabla = \vec{J} + (\partial \vec{D} / \partial t)$
   c) $\nabla x \vec{H} = \vec{J} + (\partial \vec{D} / \partial t)$ d) $\vec{H} = \vec{J} + (\partial \vec{D} / \partial t)$
8. For free space the volume charge density , conductivity is ----------
9. MHD power generators, do not require the use ----------in the gas stream, they can operate at much higher temperatures.

10. -------- is a method based on solving partial differential equations

a) FEM b) MoM

c) FIT d) FDTD

PART B (10 x 2 = 20 Marks)

11. Transform the Cartesian co-ordinates x=2, y=1 and z=3 into spherical coordinates
12. Determine the divergence of field vector $P=x^2yza_x + xza_z$
13. What is lorentz force?
14. Give integral expression for the force on a closed circuit that carries a current I in a magnetic field H
15. Draw and infer the Hysteresis from B_H diagram
16. Voltage between the 0.625µF capacitor is 4V. Find energy stored in the capacitor.
17. Mention the significance of skin effect .
18. Distinguish between conduction current and displacement current.
19. List out some of the software tools for MoM
20. Can we employ a fluid conductor as the working substance in a power generator?

PART C (5 x 14 = 70 Marks)

21. a) Derive the expression for maxwell's equations for time varying electric and magneti fields in both integral and differential form

22. a) (i) Prove that the divergence of a curl of a vector is zero using stroke's theorem (7)

(ii) Point charges 1mC and -2mC are located in (3,2,-1) and (-1,-1,4) respectively. Calculate the electric force on a 10nC charge located at (0,3,1) and the electric field intensity at that point. (7)

(OR)

b) Determine the electric field intensity due to an infinite line charge having uniform charge density of ρL c/m at any point P.

23. a) (i) State and prove Gauss law of electrostatics with neat diagram and discuss any two of its applications (10)

(ii) Two point charges -4µC and 5µC are located at (2,-1,3) and (0,4,-2) respectively. Find the potential at (1,0,1) assuming zero potential at infinity. (4)

(OR)

b) (i) Using biot – savart ‘s law , derive the magnetic field intensity on the axis of a circular loop carrying a steady current I . (7)

(ii) Derive the continuity equation of current (7)

24. a) (i) Assuming static conditions , obtain the boundary conditions for the magnetic filed with neat sketches (10)

(ii) (4)

Given the magnetic vector potential $A=\rho/4$ $\mathbf{a_z}$ Wb/m , calculate the total magnetic flux crossing the surface $\varphi=\pi/2$, $1\leq \rho\leq 2$ m, $0\leq z\leq 5$ m

(OR)

b) Find the expression for cylindrical capacitance using Laplace’s equation.

25. a) Evaluate the risk factors due to the EM field in case of power lines and mobile phone usage

(OR)

b) Discuss the with neat diagrams how a MHD is acting as a turbogenerator

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