

R09

Code No: 09A30205

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B.Tech II Year I Semester Examinations, November/December-2013

Electromagnetic Fields

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) State and explain Gauss's Law.
- b) Given $\vec{D} = 5x^2\vec{a}_x + 10za_z$ c/m², find the net outward flux crossing the surface of a cube 2m on an edge centered at the origin and the edges of the cube are parallel to the axes. [15]
- 2.a) Derive Laplace and Poisson equation.
- b) What is an electric dipole? Obtain expression for torque experienced by an electric dipole in a uniform electric field. [15]
- 3.a) Get the conditions at a boundary between two dielectrics.
- b) In the free-space region $x < 0$, the electric field intensity is $E_1 = 3a_x + 5a_y - 3a_z$ V/m. The region $x > 0$ is a dielectric for which $\epsilon_r = 3.6$. Find the angle θ_2 that the field in the dielectric makes with the $x = 0$ plane. [15]
- 4.a) Derive expression for magnetic field intensity on the axis of a circular loop carrying a current of I-amperes.
- b) Two identical circular current loops of radius $r = 3$ m and $I = 20$ A are in parallel planes, separated on their common axis by 10 m. Find H at a point midway between the two loops. [15]
- 5.a) State and explain Amperes circuited law.
- b) Derive expression for field due to a square loop. [15]
- 6.a) Explain Lorentz force equation.
- b) Show that the force between two parallel conductors carrying current in the same direction is attractive. [15]
- 7.a) Explain self and mutual inductance.
- b) A toroid with cross section of radius 2 cm has a silicon steel core of mean length 28 cm and an air gap of length 1 mm. Assume the air-gap area, S_a , is 10% greater than the adjacent core and find the mmf required to establish an air-gap flux of 1.5 mwb. [15]
8. Write short notes on
 - a) Statically and dynamically induced emfs.
 - b) Poynting theorem. [15]

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