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Total Number of Pages: 02

B.TECH
PCEE4302

6th Semester Regular / Back Examination 2015-16

ELECTROMAGNETIC THEORY

BRANCH: ELECTRICAL

Time: 3 Hours

Max Marks: 70

Q.CODE: W196

**Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.**

Q1 Answer the following questions:

(2 x 10)

- Transform the Cartesian co-ordinates $x=2$, $y=1$ and $z=3$ into spherical coordinates.
- State the magnetic boundary conditions.
- Determine the force per unit length between two long parallel wires separated by 5cm in air and carrying currents of 40A in the same direction.
- Distinguish conservative field from non-conservative field and give examples for both.
- Give the relationship between potential gradient and electric field.
- A parallel plate capacitor with plate area of 5 cm^2 plate separation of 3 mm has a voltage $50 \sin(103 t)$ applied to its plates. Calculate the displacement current assuming $\epsilon = 2 \epsilon_0$
- Write the Maxwell's equations from Faraday's law both in integral and point forms.
- Write Laplace's equation in cylindrical co-ordinates.
- How Gauss law is applied, when there is no symmetry?
- What are the differential elements in spherical coordinate system?

Q2 a) From the fundamental laws, obtain the Maxwell's equations in integral form and convert them into differential form. (5)

b) Derive an expression for self inductance of co-axial cable of inner radius 'a' and outer radius 'b'. (5)

Q3 A rectangular loop (8×4)m, carrying 10A current is placed on $z=0$ plane. Find the field intensity at (4,2,0)m. (10)

Q4 a) Define Gradient, Divergence and Curl. Explain their significance. (5)

b) State superposition theorem in relevance to the field theory and derive the equation for total electric field intensity. (5)

- Q5 a) Define depth of penetration. Derive its expression. (5)
 b) Three concentrated charges of $0.25 \mu\text{C}$ are located at the vertices of an equilateral triangle of 10 cm side. Find the magnitude and direction of the force on one charge due to other two charges. (5)
- Q6 a) Derive the equation of continuity of current. (5)
 b) Given $A = 5ax$ and $B = 4ax + tax$. Find 't' such that the angle between A and B is 45 degree. (5)
- Q7 a) State and explain Ampere's circuital law. (5)
 b) Explain Biot's Savart law in vector form. (5)
- Q8 **Write Short Notes (Any Two)** (5 x 2)
 a) Uniqueness theorem.
 b) Pointing Theorem.
 c) Stoke's theorem
 d) Prove that $\nabla \cdot \nabla \times H = 0$