

Code No: R21029

R10**SET - 1****II B. Tech I Semester Supplementary Examinations, Dec - 2015****ELECTRO MAGNETIC FIELDS**

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** QuestionsAll Questions carry **Equal** Marks

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1. a) Describe the concept of electric field and derive the expression for the electric field due to a point charge.  
b) Determine the field strength at a point situated 6cm away from two equal charge of  $Q_1 = +10^9\text{C}$  and other charge of  $Q_2 = 10^9\text{C}$ , if the distance between them is 9m.
2. a) Derive the expression for electric field intensity due to an electric dipole,  
b) Prove that the potential due to an electric dipole satisfies Laplace's equation
3. a) Derive the point form of Ohm law for conductors.  
b) Explain about the conduction and convection current densities.
4. a) State and explain Biot-Savart's law.  
b) Derive the expression for magnetic field intensity at the center of a circular wire?
5. a) Prove that  $\oint \mathbf{H} \cdot d\mathbf{l} = I$ .  
b) A single phase circuit comprises two parallel conductor X and Y, each 1 cm diameter and spaced 1m apart. The conductors carry currents of +100 and -100A, respectively. Determine the field intensity at the surface of each conductor and also in space exactly midway between X and Y.
6. a) Derive the Lorentz force equation for moving charges in magnetic field.  
b) A straight solid wire segment carrying a current  $2\sqrt{3}\text{A}$  extends from A (0, 1, 2) to B (0, 4, 2) in free space. This wire is subjected to the magnetic field of an infinite current filament lying along z- axis and carrying 25A in the  $U_z$  direction. Find the vector torque on the wire segment about as origin at (i)  $P_A (0,0,2)$ , (ii)  $P_B (0,0,0)$ , (iii)  $P_C (0, 2, 0)$ .
7. a) Derive the expression for determination of energy stored in a magnetic field.  
b) Derive an expression for the mutual inductance if two straight filamentary circuits of length L and of infinitesimal cross section which are parallel to each other and a distance D apart.
8. a) Write down the Maxwell's equations in integral form and explain their significance.  
b) Show that the total displacement current between the condenser plates connected to an alternating current voltage source is exactly the same as the value of charging current flowing in the leads.