Code No: 123BY JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD B.Tech II Year I Semester Examinations, November/December - 2016 ELECTROMAGNETIC FIELDS (Electrical and Electronics Engineering)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B. Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

		(25 Marks)
1.a)	Write the properties of potential function.	[2]
b)	What is Maxwell's first law?	[3]
c)	Define electric dipole.	[2]
d)	Define Convection and conduction current densities.	[3]
e)	Define Magnetic field intensity.	[2]
f)	Write the applications of Ampere's circuital law.	[3]
g)	Write the vector Poisson's equation.	[2]
h)	What are the applications of permanent magnets?	[3]
i)	Define time varying fields.	[2]
j)	How dynamically induced EMF is produced?	[3]

PART-B

(50 Marks)

- 2.a) State and prove Gauss's law as applied to an electric field and determine the field due to an infinite line charge.
 - b) Derive Poisson's and Laplace equations starting from point form of Gauss Law.

[5+5]

OR

- 3.a) Show that the electric filed intensity at any point inside a hollow charged Spherical conductor is zero.
- b) Three point charges each 5 nC are located on the x-axis at points: -1, 0 and +1 m in free space. (i) Find E at x=5. (ii) Determine the value and location of the equivalent single point charge that would produce the same field at very large distance. [5+5]
- 4.a) Establish the electrostatic boundary conditions for the tangential components of electric field and electric displacement at the boundary of two non dielectrics.
 - b) The relative permittivity of dielectric in a parallel plate capacitor varies linearly from 4 to 8. If the distance of separation of plates is 1 cm and area of cross-section of plates is 12 cm², find the capacitance. Derive the formula used. [5+5]

OR

- 5.a) A spherical capacitor with inner sphere of radius 1.5 cm and outer sphere of radius 3.8 cm has an homogeneous dielectric of $\varepsilon = 10 \varepsilon_0$. Calculate the capacitance of the sphere of the sphere of the sphere of the capacitance of the sphere of the sp
 - b) Prove that the derivative of the energy stored in an electrostatic field with respect to volume is ¹/₂ D.E, where D and E electric flux density and electric field intensity respectively. [5+5]

- 6.a) State and explain Biot-Savart's law and derive the expression for the magnetic field at a point due to an infinitely long conductor carrying current.
 - What are the limitations of Amperes current law? How this law can be modified b) to time varying field? [5+5]

OR

- 7.a) Derive Maxwell's second equation div (B)=0.
 - b) Derive magnetic field intensity due to a square current carrying element. [5+5]
- Derive the Neumann's formulae for the calculation of self and mutual 8.a) inductances.
 - b) Explain the concept of vector magnetic potentials. [5+5]

OR

- 9.a)
- Determine the inductance of a toroid. A rectangular coil of area 10 cm^2 carrying a current of 50 A lies on plane **b**) 2x + 6y - 3z = 7 such that the magnetic moment of the coil is directed away from the origin. Calculate its magnetic moment. [5+5]
- 10.a) Explain concept of displacement current and obtain an expression for the displacement current density.
 - b) Explain in detail about modification of Maxwell's equations for time varying fields. [5+5]

OR

- 11.a) Explain Faraday's laws of electromagnetic induction and derive the expression for induced EMF.
 - b) Derive Maxwell's equations in integral form for time varying Fields. [5+5]