Code No: 133AP **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2018
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) Define electro static field and mention any two sources. [2]
b) Find the potential at $R_A = 5m$ with respect to $R_B = 15m$ due to point change $Q = 500\ \mu c$ at the original and zero reference at infinity. [3]
c) What are Conductors and Insulators? Give examples. [2]
d) Derive Ohm' law in point form. [3]
e) Deduce the Relation between magnetic flux, magnetic flux density. [2]
f) Find the magnetic field intensity due to a current carrying conductor with finite length. [3]
g) Explain Lorentz force equation. [2]
h) Derive Neuman's formula for mutual inductance. [3]
i) State Faraday's law of electromagnetic induction. [2]
j) Determine the e.m.f induced about the path r=0.5, z=0, t=0. If B=0.01sin377t. [3]

PART-B

(50 Marks)

2.a) Three equal positive charges of 4×10^{-9} coulomb each are located at three corners of a square, side 20cm. determine the electric field intensity at the vacant corner point of the square.
b) State and explain Maxwell's first law. [5+5]

OR

3.a) What is an electric dipole? Obtain expression for torque experienced by an electric dipole in a uniform electric field.
b) Derive the expression for Potential gradient. [5+5]

4.a) Derive the expression for the energy stored in the charged condenser.
b) The capacitance of a parallel plate condenser is 0.2μF. Potential difference between the plates is 2V. Calculate the energy stored by the charged condenser. [5+5]

OR

5.a) Differentiate static electric and magnetic fields.
b) Derive Equation of continuity. What is its significance? [5+5]

6.a) Find the Magnetic Field Intensity due to a straight current carrying filament.
b) Find the magnetic field intensity at the centre O of a square loop of sides equal to 5M and carrying 10A of current. [5+5]

OR

7.a) State Ampere's circuital law and prove the same.

b) In the region $0 < r < 0.5$m, in cylindrical co-ordinates, the current density is $J = 4.5e^{-2r}\hat{a}_z \left(A/m^2\right)$ and J = 0 elsewhere. Use Amperes law to find H. [5+5]

8.a) Derive an expression for magnetic field strength H, due to a current carrying conductor of finite length placed along the y-axis, at a point P in x-z plane and r distant from the origin.

b) What is scalar magnetic potential? Give its limitations. [5+5]

OR

9.a) A toroid with cross section of radius 2cm has a silicon steel core of mean length 28cm and an air gap of length 1mm. Assume the air-gap area is 10% greater than the adjacent core and find the mmf required to establish an air-gap flux of 1.5 mwb.

b) Explain the concept self and mutual inductances. [5+5]

10. Write Maxwell's equation for static fields. Explain how they are modified for time varying electric and magnetic fields. [10]

OR

11.a) Generalize Ampere's law for time varying fields.

b) In a material for which σ = 5.0 s/m and $\in r$ = 1, the electric field intensity is E = 250 Sin1010t (V/m). Find the conduction and displacement current densities and the frequency at which they have equal magnitudes. [5+5]

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