2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS
ELECTROMAGANETIC FIELD
(ELECTRICAL & ELECTRONIC ENGINEERING)

MAY 2005

TIME 3 HOURS
MARKS: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) State and explain Gauss's law.
(b) Explain and define the potential at a point in an electric field. Derive the potential at any point in a field due to a point change.

(c) Find the p.d between the points a and b which are at a distance of 0.5m and 0.1m respectively from a negative change of 20x10-10 coulomb.

2. (a) Derive the expression for the capacitance of co-axial cable with two dielectrics.

(b) Determine the capacitance of a capacitor consisting of two parallel metal plates 30 cm x 30 cm, surface area, separated by 5mm in air. What is the total energy stored by the capacitor if the capacitor is charged to a.p.d of 500V? What is the energy density?

3. (a) Explain
i. Dipole and
ii. Dipole moment.

(b) Derive the conditions at a boundary between two dielectrics.
(c) State Ohm's law in paint form.

4. (a) State and explain Biot-savart's law?

(b) Develop an expression for the magnetic filed at any point on the line through the centre at a distance 'h' from the centre and perpendicular to the plane of a plane circular loop of radius 'a' and carrying current 'I' amperes.

5. (a) State and explain Ampere's law.
(b) Two wires carrying currents in the same direction of 5,000 A and 10,000 A are placed with their axes 5cm apart. Calculate the force between them in N per metre length.

(c) What is the maximum torque on a square loop of 1000 turns in a field of uniform flux density Tesla? The loop has 10cm sides and carries a current of 3A.

6. (a) Explain magnetic vector potential.
(b) Derive the formula for the inductance of a pair of parallel conductors.

(c) Calculate the loop-inductance per kilometer of 2 parallel round conductors spaced 80cm apart and having a conductor diameter of 1cm.

7. (a) State and explain Faraday's laws of electromagnetism.

(b) A solenoid is made up of 2000 turns of wire wound on a non ? magnetic former of length 0.8m. A search coil with 500 turns and enclosing a mean area of 20 sq.cm is placed centrally in the solenoid. Determine the mutual inductance of the arrangement. Also, find the e.m.f. induced in the search coil when the current in the solenoid is increasing uniformly at the rate of 200 amperes per second.

8. (a) State and explain the Maxwell's equations in differential and integral form.
(b) Find the velocity of a plane wave in a loss-less medium having a relative permeability of unity and relative permittivity of S.
(c) What is poynting vector?