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JAYA GROUP OF INSTITUTIONS – Thiruninravur.

IV SEM – B.E

INTERNAL ASSESSMENT – II (MODEL EXAMINATION- II)

Sub. code: EC6403 Date: 9.3.15

Sub. Name: Electromagnetic Fields Branch: ECE

Duration: 180 mts Max. Marks: 100

Answer ALL Questions

Part- A (10 x 2=20 marks)

1. A circular coil of radius 10cm is made up of 100 turns. It carries a current of 5A. Compute the magnetic field intensity at the centre of the coil.
2. Determine the magnetic field strength of a 200 turn coil excited by a current of 2A. The length of the solenoid is 0.25m.
3. A circular loop located on $x^2 + y^2 = 4$, z=0 carries direct current of 7A along a_ϕ . Find magnetic field intensity at (0,0,-5).
4. Define magnetic flux density.
5. Compare vector magnetic potential and scalar magnetic potential.
6. A coaxial cable has two conductor aligned radially with radius 1mm of the core conductor and 7mm of the outer conductor. If the insulator is in free space determine the self-inductance of the coaxial cable when the length is known to be 100m.
7. What is the maximum torque on a square loop of 1000 turns in a field of flux density of 1 Tesla. The loop has 10cm sides and carries 3A. What is the magnetic moment of the loop?
8. Two wires carrying in the same direction 500A and 800A are placed with their axes 5cm apart. Calculate the force between them..
9. Define magnetization and magnetic susceptibility.
10. Write the nature of the magnetic materials.

Part- B (5 x 16 = 80 marks)

11.a.i. Estimate the magnetic field intensity for a straight conductor. (8)

ii. Calculate the magnetic flux density due to circular coil of 100A turns and area of $70cm^2$ on the axis of coil at a distance of 10cm from the centre. (8)

Or

11.b.i. Prove Ampere's circuital law. Write the point form of Ampere's circuital law. (8)

ii. In an electron beam of radius 'b' $J = J_0 (1 - r/b)\ k$; $r < b$, find magnetic field intensity at the surface of the beam. (8)

12.a.i. State Biot-Savart law. Derive it. (8)

ii. By applying Biot-Savart law, find magnetic flux density at the centre of a circular current carrying wire of radius 1m. The current in the wire is 100A. Medium is air. (8)

Or

12.b.i. Derive the expression for vector magnetic potential. (8)

ii. In cylindrical coordinate, $A = 50\ \rho^2\ a_z$ Wb/m is a magnetic vector potential in a certain region of free space. Find magnetic field intensity, flux density and current density. (8)

13.a. Derive the steady magnetic field laws. (16)

Or

13.b. Evaluate the inductance of the co-axial cables and transmission lines. (16)

14.a.i. Derive the magnetic boundary conditions. (8)

ii. A solenoid has an inductance of 20mH. If the length of the solenoid is increased by two times and the radius is decreased to half of its original value, find the new inductance (8)

Or

14.b.i. Derive the expression for the energy density in a magnetic field. (8)

ii. Find the energy stored in the solid having 50cm long and 5cm in diameter and is wound with 2000 turns of wire carrying a current of 10A. (8)

15.a.i. Find the force between current elements. (8)

ii.The force between two wires carrying current in the opposite direction is 20.4Kg//m when they are placed with their axis 5cm apart. Calculate current in one conductor when current in another conductor is 5KA. (8)

Or

15.b.i. Derive the inductance for a toroid. (8)

ii.A toroid is wound with 300 turns on an ebonite ring having a cross section area of $4cm^2$ and a mean circumference of 35cm. Calculate 1. inductance of coil 2. induced emf when the current is reduced at the rate of 200 A/sec. 3.If the toroid has a second winding of 80 turns wound over the ebonite ring and inside the first winding of 300 turns . Calculate mutual inductance. (8)