Hall Ticket No | | | | | | | | | | | Question Paper Code:AEEC06

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
(Dundigal-500043, Hyderabad)

B.Tech III SEMESTER END EXAMINATIONS (REGULAR) - FEBRUARY 2022
Regulation:UG-20
ELECTROMAGNETIC FIELDS

Time: 3 Hours **(EEE)** **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
NOTE: Provision is given to answer TWO questions from among one of the Modules III / IV / V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) State and explain Coulombs law and obtain expression for force between the two charges. **[7M]**
   (b) Derive an expression for the electric field intensity due to infinite length line charge. **[7M]**

MODULE – II

2. (a) Derive the expressions for energy stored and energy density in static electric field. **[7M]**
   (b) The capacitance of the capacitor formed by two parallel plates, each $100cm^2$ in area separated by a dielectric 2mm thickness is $2*10^{-4}$F. A potential difference of 20KV is applied. Determine:
   i) Total dielectric flux in coloumbs
   ii) The potential gradient in KV/m
   iii) The relative permittivity of the material. **[7M]**

MODULE – III

3. (a) Determine an expression for magnetic field intensity due to circular current carrying wire. **[7M]**
   (b) A uniform solenoid 100mm in diameter and 400mm long has 100 turns of wire and a current of I = 3A. Find the magnetic field on the axis of the solenoid.
   i) At the center
   ii) At on end
   iii) Half the way. **[7M]**

4. (a) State Ampere's circuit law. Using Ampere circuital law, derive the expression for magnetic field intensity due to long current carrying filament. **[7M]**
   (b) A current of 1A is flowing in a circular coil of radius 10cm and 20 turns. Calculate the intensity of magnetic field at a distance 10cm on the axis of the coil and at the centre. **[7M]**

MODULE – IV

5. (a) Show that the force between two parallel conductors carrying current in the same direction is attractive. **[7M]**
   (b) Two long parallel conduction carrying 100A. If the conductors are separated by 200mm. Find the force per meter of each conductor if the current flow direction is in opposite direction. **[7M]**.

6. (a) Discuss about torque on a current loop placed in a magnetic field. Find an expression for inductance of solenoid. **[7M]**

   (b) A toroidal coil of 500 turns is wound on a steel ring of 0.5m mean diameter and $2*10^{-2}$ m^2 cross sectional area. An excitation of 4000A/m produces a flux density of 1 Tesla. Compute the inductance of the coil. If a 10mm long gap is cut in the ring, determine the current required to maintain the flux density at 1 Tesla. Also find the inductance under these new conditions. **[7M]**

MODULE – V

7. (a) State the Faraday's laws of electro-magnetic induction and derive the expression for induced emf. **[7M]**

   (b) Derive the integral forms of the four Maxwell's equations for time varying fields from the respective point forms. **[7M]**

8. (a) State and explain skin effect. Discss about plane waves in free space. **[7M]**

   (b) A conductor of length 100cm moves at right angles to a uniform field of strength 10000 lines per cm^2, with a velocity of 50 meters/sec. Calculate the EMF induced in it. Compute also the value of the induced EMF when the conductor moves at an angle of 30 degrees to the direction of the field. **[7M]**

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