[06 BENG – 2102]

II/IV B.Tech. DEGREE EXAMINATION.

First Semester

Electrical and Electronics Engineering

ELECTROMAGNETIC FIELDS

(Effective from the admitted batch of 2015–2016)

Time : Three hours   Maximum : 70 marks

Answer question No. 1 is compulsory and Answer any FOUR from remaining.

All questions carry equal marks.

1.   (a)   Define vector product of two vectors.

      (b)   State Ampere's circuital law.

      (c)   What is magnetic dipole moment?

      (d)   What is displacement current?

      (e)   Write the point form of Ohm's law.

      (f)   Define propagation constant.

      (g)   Define Polarization and state different types of polarizations.

2.   (a)   State and prove divergence theorem.

      (b)   What are the major sources of electromagnetic fields?

3. (a) Derive the expressions for magnetic field intensity and magnetic flux density due to circular.

   (b) Derive an expression for the electric field due to a straight and infinite uniformly charged wire of length 'L' meters and with a charge density of $+\lambda$ c/m at a Point 'P' which lies along the perpendicular bisector of wire.

4. (a) Derive an expression for force between two current carrying conductors.

   (b) An iron ring with a cross sectional area of 3 cm square and mean circumference of 15 cm is wound with 250 turns wire carrying a current of 0.3A. The relative permeability of ring is 1500. Calculate the flux established in the ring.

5. (a) What is magnetization? Explain the classification of magnetic materials with examples.

   (b) Calculate magnetic field intensity at the centre of square loop of side 5 m carrying 10 A of current.

6. (a) Write short notes on faradays law of electromagnetic induction.

   (b) The magnetic field intensity in free space is given as $H = H_0 \sin\theta$ at 't' A/m. Where $\theta = \omega t - \beta z$ and β is a constant quantity. Determine the displacement current density.

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7. (a) Discuss about the plane waves in lossless dielectrics.

   (b) Solve the depth of penetration of plane wave in copper at a power frequency of 60Hz and at a microwave frequency of 1010 Hz. Given $\sigma = 3.8 \times 10^7$ mho/m.

8. (a) Show Maxwell's equation for static fields. Explain how they are modified for time varying electric and magnetic fields.

   (b) Electric flux density in a charge free region is given by $D = 10x\,\hat{a}_x + 5y\,\hat{a}_y + Kz\,\hat{a}_z$ C/m2, find the constant K.

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