

T-2925-T.E.(Electrical) (sem-II) (Rev-2012) (CBGS) May-2018 1/1  
Q.P.Code: 38371  
Sub: Electromagnetic fields & waves

Duration: 3Hrs

15/05/2018 Marks: 80

- Note: (a) Question No:1 is compulsory  
(b) Attempt any 3 Questions from the remaining questions

- Q1. Attempt any four questions from the remaining questions. (20)
- (a) What do you mean by irrotational and solenoidal fields?
  - (b) What is Lorentz force equation for a moving charge?
  - (c) Enlist 5 properties of electromagnetic waves.
  - (d) Define gradient. Derive the relation between  $\mathbf{E}$  and voltage gradient.
  - (e) State and explain coulombs law in electrostatics. Hence define unit charge.
- Q2. (a) A point charge  $Q_1 = 2\text{mC}$  is located in free space at  $P_1(-3, 7, -4)$  while  $Q_2 = 5\text{mC}$  is at  $P_2(2, 4, -1)$ . Find  $\mathbf{F}_2$  and  $\mathbf{F}_1$ . (10)
- (b) Derive an electric field intensity due to an infinite plane having density  $\rho_s$  ( $\text{C/m}^2$ ). (10)
- Q3. (a) An electric flux density  $\mathbf{D} = 2x\mathbf{a}_x + 3y\mathbf{a}_y$   $\text{C/m}^2$ . Determine the net flux crossing the surface of a cube of 2m side and centred at origin, with edges parallel to the axes. Evaluate both side of the divergence theorem. (10)
- (b) Derive boundary condition at the interface of two dielectric material. (10)
- Q4. (a) Explain Maxwell equation for the time varying field. (10)
- (b) Starting from Maxwell equation obtain wave equation for the field  $\mathbf{E}$  and  $\mathbf{H}$  for free space. (10)
- Q5. (a) State and explain Biot-Savart Law. Derive the mathematical expression for Biot-Savart Law. (10)
- (b) Derive the E-field intensity due to a infinite line charge. (10)
- Q6. (a) Given that  $\mathbf{H} = H_m e^{j(\omega t + \beta z)} \mathbf{a}_x$  (A/m) in free space. Find  $\mathbf{E}$ . (10)
- (b) Derive Poisson's and Laplace equation. Also derive the point form of continuity equation. (10)

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