H.T.No. | | | | | | | | | | |

Code No: EE1511 **GEC-R14**

II B. Tech I Semester Regular Examinations, November 2016

ELECTROMAGNETIC FIELDS

(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 60**

Note: All Questions from **PART-A** are to be answered at one place.
Answer any **FOUR** questions from **PART-B.** All Questions carry equal Marks.

PART-A

6 × 2 = 12M

1. State Coulomb's law in vector form.
2. Verify that the potential field given below satisfies the Laplace's equation.
   $V = 4x^2 - 6yz + 2z^2$.
3. State Biot-Savart's law.
4. Write an expression for force between two straight long parallel conductors carrying currents in the same direction with suitable diagram.
5. Derive the self inductance of Toroid.
6. State Faraday's laws of electromagnetic induction

PART-B

4 × 12 = 48M

1. a) Derive Electrical field intensity due to Infinite Surface Charge, ρ_s. (6M)
   b) Two point charges -4μC and 5μC are located at (2, -1, 3) and (0, 4, -2) respectively. Find the potential at (1, 0, 1) assuming zero potential at infinity. (6M)
2. a) A parallel plate capacitor contains three dielectrics with ε_{r1} = 1, d_1 = 0.2mm; ε_{r2} =2, d_2 = 0.3mm; ε_{r3} = 3, d_3 = 0.4mm. The surface area is 20cm^2. The potential difference between the plates is 100V (8M)
   i) Find total capacitance
   ii) Find total energy stored?
   b) Derive the equation of point form of *Ohm's law* (4M)
3. a) Derive an expression for _H due to an infinite by long current carrying conductor. (6M)
   b) In the cylindrical region 0<ρ <0.5 m the current density is $J = 4.5\, e^{-2\rho}\, a_z$ A/m2 and J= 0 elsewhere. Use Ampere's law to find H. (6M)
4. a) Derive the equation for torque and force in a rectangular current loop in a magnetic field. (6M)

b) A 0.2 μC point charge, moving through the field E = $20a_z$ V/m, is located at the origin at t= 0 with a velocity of 10^5 a_y m/s. The mass of charge is $2*10^{-16}$ kg. At t=2 μs., find the velocity v and the kinetic energy. (6M)

5. a) Derive the energy stored and density per unit volume in a magnetic field. (6M)

b) A solenoid of 10 cm in length consists of 1000 turns having the cross section radius of 1 cm. find the inductance of solenoid. What is the value of current required to maintain a flux of 1 mWb in the solenoid. Take μ_r= 1500. (6M)

6. a) Write Maxwell's equations in differential and integral form in time varying and time invariant fields.. (8M)

b) Obtain the expression for Displacement current density. (4M)

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