Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: V (Electronics & Communication Engineering)

CBCS Regular Examination Nov-Dec 2016

2EC502 Electromagnetic Theory

Time:3 Hours **Total Marks: 60**

Instructions: 1. All questions are compulsory.
2. Write answer of each section in separate answer books.
3. Figures to the right indicate marks of questions.

Section - I

Que. – 1 **A** State the Biot- Savart's law and derive the equation for the value of the differential amount of the magnetic field intensity. **5**

B Derive the Maxwell's equations for a time varying field. **5**

OR

Que. – 1 **A** What is the difference between a static and a time varying field? Derive the equation for the continuity equation of current in a time varying field. **5**

B Given the vector magnetic potential, $\bar{A} = -r^2/4\,\overline{a_z}$ (Wb/m), Determine $\bar{B}$ at (6,25°,2). **5**

Que. – 2 **A** Explain the different types of electromotive force resulting from Faraday's law. **6**

B Define the Vector and the Scalar magnetic potential with the required equations. **4**

OR

Que. – 2 **A** What is Torque? Derive an expression for the torque in a magnetic field B and the magnetic dipole moment. **6**

B Derive the wave equation for electric and magnetic field if the wave is propagating in a lossless medium. **4**

Que. – 3 **B** Derive the Magnetic boundary conditions for a vector field travelling from one medium to another. **6**

C Define and explain the physical significance of divergence and the curl. **4**

Section – II

Que. – 4 **A** Discuss about the coulomb's law. **3**

B Define the workdone. **2**

C A sheet of Charge $\rho_S = 2nc/m^2$ is present at x=3 in free space is located at x=1 and z=4. find (a) the magnitude of the electric field intensity at the origin (b) the direction of $\bar{E}$ at (4,5,6). **5**

OR

Que. – 4 **A** Explain the concept of electric field intensity. **3**

B An infinitely long uniform line charge is located at by y=3, z=5. If ρ_L=30nC/m, find $\bar{E}$ at (a) the origin (b) Q_b (0,6,1). **5**

C Define Electric flux with necessary figure. **2**

Que. – 5 A Discuss about the electric flux and electric flux density. Derive the relationship of Electric flux density and Electric field intensity. 4

B Let $\bar{D} = y^2z^3\overline{a_x} + 2xyz^3\overline{a_y} + 3xy^2z^2\overline{a_z}pC/m2$ in free space. (1) Find the total electric flux passing the surface $x = 3, 0 \leq y \leq 2, 0 \leq z \leq 1$ in a direction away from the origin. (2) Find the $|\bar{E}|$ at P (3,2,1) (3) Find the charge contained in an incremental sphere having a radius of 2μm centered at P(3,2,1). 6

OR

Que. – 5 A Explain the current density. Derive relationship between current density, volume charge and its velocity. 5

B If $V = {60 \sin\theta}/{r^2}$ V in free space and point P located at r=3m, 5

$\theta = 60^\circ, \emptyset = 25^\circ$, find (a) V_P (b) E_P (c) ${dV}/{dN}$ at P (d) $\bar{a}_N$ at P (e) ρ_V at P.

Que. – 6 A Given points A(2,5,-1), B(3,-2,4) and C(-2,3,1) Calculate: 5

(a) $\overline{R_{AB}} \cdot \overline{R_{AC}}$
(b) The angle between $\overline{R_{AB}}$ and $\overline{R_{AC}}$.
(c) The length of projection of $\overline{R_{AB}}$ on $\overline{R_{AC}}$.
(d) The vector projection of $\overline{R_{AB}}$ on $\overline{R_{AC}}$.

B Define: Position vector and Unit vector. 2

C Differentiate between Electric and Magnetic field. 3

END OF PAPER