Instructions: i) All the answers must be in the same order.

ii) Scientific calculators are allowed.

Section-A

Answer all the questions   5x1M=5M

1. Two point charges -q and $+\frac{q}{2}$ are situated at the origin and at point (a,0,0) respectively .Find the location along the X-axis where the electric field intensity becomes zero.

   (a) $X = \frac{a}{\sqrt{2}}$ (b) $\sqrt{2}$ a   (c) $X = \frac{\sqrt{2}\,a}{\sqrt{2}-1}$ (d) $X = \frac{\sqrt{2}\,a}{\sqrt{2}+1}$

2. A charge q placed at the center of the cube .Find the total electric flux through any two surfaces of the cube is

   (a) $\frac{2}{3}(q/\epsilon_0)$ (b) $\frac{1}{3}(q/\epsilon_0)$ (c) $\frac{1}{6}(q/\epsilon_0)$ (d) (q/ϵ_0)

3. The work done in moving the charge of magnitude 2 µC to move on equipotential surface of potential 12 V.

   (a) 24 µJ   (b) 0   (c) 24 J   (d) -24 µJ

4. If there are n capacitors of capacitance 'C' are in parallel connected to battery of voltage 'V' ,then the energy stored in the system is equal to

   (a) CV^2 (b) $\frac{1}{2}CV^2$ (c) $\frac{1}{2}nCV^2$ (d) $\frac{1}{2n}CV^2$

5. The electric field of magnitude 3×10^3 V/m allowed through a copper conductor of resistivity 1.7×10^{-8} Ω m .Find the current density in A/m².

   (a) 5.1×10^5 (b) 1.76×10^{11} (c) 1.76×10^{-11} (d) 5.86×10^{-11}

Section-B

                                                                                              2x5M= 10M

Answer any two questions

6. (a)What is Gauss law? Using Gauss law derive the expression of electric field intensity due to infinitely long straight uniformly charged wire.   **[3M]**

   (b)The electric field in a region is given by **E**= 3i +2j N/C .Find the electric flux passing through a square area of side 40 cm parallel to Y-Z plane .   **[2M]**

7. (a)Derive the expression of potential energy of a dipole in an external electric field. **[3M]**

   (b)Find the magnitude of Electric field intensity and potential due to dipole of dipole moment of 10 µC-m at a point 10 cm from the center of the dipole in the equatorial plane. **[2M]**

8. Derive the expression for capacitance of parallel plate capacitor   **[3M]**

   (b)Find the charge on the C_2 of the following network.   **[2M]**