



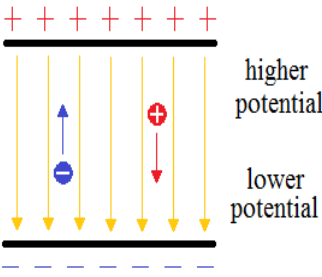
United International University

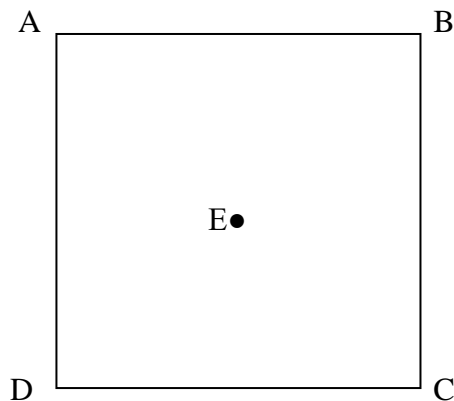
School of Science and Engineering

Final Examination; Year 2021; Semester: Summer

Course: PHY 2105/105; Title: Physics

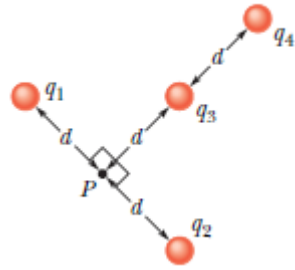
Full Marks: 25; Section: A-F; Time: 1:15 hour

1. a)  In figure, negative and positive charges are moving from lower to upper and upper to lower plates respectively. (i) Does negative/positive charge increase/decrease its electrical potential energy? (ii) Is the negative/positive work done by the electric field on negative/positive charge? [3] CO1
- b) The direction of a uniform electric field is parallel to the +X axis. A dipole consists of $\pm q$ charges separated by a distance d . The dipole is placed with an angle $\theta = 60^\circ$ in the electric field. (i) Draw the arrangement of dipole and electric field. (ii) Show the direction of rotation of dipole in the electric field. [2] CO1
2. a) Two equal positive charges are on a line established an electric field at a point in the same line of magnitude $E = (\text{last two digits of your ID}) \text{ N/C}$. If charges are separated by a distance 20cm and the point is 5cm from the first charge, find the value of the positive charge. ($k=9 \times 10^9 \text{ Nm}^2/\text{C}^2$) [2] CO3
- b) Suppose you have a 5 V battery, a 6 μF capacitor, and a 7 μF capacitor which is acting in an electric field of 8 N/C. (i) Find the equivalent charge and (ii) energy stored, if the capacitors are connected to the battery in series. ($\epsilon_0 = 8.854 \times 10^{-12} \text{ F/m}$) [4] CO3
- c) A square of side 50cm is shown in fig. below. Charge arrangements at four corners are $A = B = (\text{last two digits of your ID}) \text{ C}$, $C = D = -(\text{last two digits of your ID}) \text{ C}$. What is the electric potential at E due to charge at A, B, C and D? [3] CO3



3. a) A fuse in an electric circuit is a wire that is designed to melt, and thereby open the circuit, if the current exceeds a predetermined value. Suppose that the material to be used in a fuse melts when the current density rises to 440 A/cm^2 . What diameter of cylindrical wire should be used to make a fuse that will limit the current to 0.50 A? [2.5] CO3

- b) In Fig. below the four particles are fixed in place and have charges $q_1 = q_2 = +5e$, $q_3 = +3e$, and $q_4 = -12e$. Distance $d = 5.0 \mu\text{m}$. What is the magnitude of the net electric field at point P due to the particles? ($e = 1.6 \times 10^{-19} \text{C}$) [2.5] CO3



- c) A cube of side 50cm and it placed in a uniform electric field $\vec{E} = 4\hat{j} + 2\hat{k}$. Find out electric flux for all faces of the cube. [You must draw the cube with axes] [2] CO3
4. Derive expression for electric field due to a dipole. Modify the expression when $z \gg d$. [4] CO2
OR Find the electrical potential due to line of charges.

CO1: Define or Justify different physical quantities; CO2: Derive various equations of Electric Field, Potential and Electricity, and Capacitance; CO3: Evaluate different numerical problems