United International University

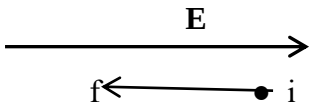
School of Science and Engineering

Final Examination; Year 2021; Semester: Fall
Course: PHY 2105; Title: Physics
Full Marks: 40; Section: B and C; Time: 2 hours +15 Min.

There are Five question. Answer to the questions 1, 2 and 3 are mandatory. Answer any one from the questions 4 and 5. It must be submitted via LMS in the following format: STUDENT ID_COURSE_ Code.pdf. For example: 011201105_PHY 2105.pdf.

1. a) What are relations between electric field and line of forces [2] CO1

   b) In the figure, we move a proton from point *i* to point *f* in a uniform electric field. Is positive or negative work done by (a) the electric field and (b) our force? (c) Does the electric potential energy increase or decrease? (d) Does the proton move to a point of higher or lower electric potential? [3] CO1



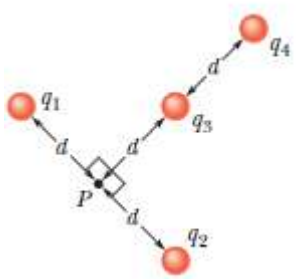
   c) Draw some equipotential surfaces of a point charge. [1]

2. a) A particle of charge +(last two digits of your ID)× 10^{-6} C is 12.0 cm distant from a second particle of charge -0.5×(last two digit of your ID)× 10^{-6} C. Calculate the magnitude of the electrostatic force between the particles which type of force is it?($k=10^{10}Nm^2/C^2$) [3] CO3

   b) Charge q_1= (last two digit of your ID)C and q_2= -(sum of last two digit of your ID)C are located on X axis at x= 6cm and x= 12cm respectively. What is resultant force and it's direction on a charge q_3 =5C located at origin? [4] CO3

   c) A charge of -1.0 μC is located of coordinates (1,0) while a second charge of +1.0 μC is located of coordinates (1, 2). Draw the charge arrangement and determine the value of the following quantities at the origin: (i) the magnitude of the electric field E, (ii) the direction of the electric field.($k=10^{10}Nm^2/C^2$) [4] CO3

3. a) In Fig. below the four particles are fixed in place and have charges $q1 = q2 = +5q$, $q3 = +3q$, and $q4 = -12q$. Distance d = 5.0 μm. What is the magnitude of the net electric field at point *P* due to the particles? (q=(last two digits of your ID)×10^{-6}C) [4] CO3



   b) What is the electric potential at point *P*, located at the centre of the square of point charges? The side of the square is 1.5 m, and the charges are q_1 =12nC, q_2 = -24nC, [3] CO3

q_3=31nC, and q_4=17nC.

c) A charge of -1.0 μC is located of coordinates (1,0) while a second charge of +1.0 μC is located of coordinates (1, 2). Draw the charge arrangement and determine the value of the following quantities at the origin: [4] CO3

(i) the electric potential (assuming the potential is zero at infinite distance), and

(ii) the energy needed to bring a +1.0 μC charge to this position from infinitely far away.

4. a} Derive expression for electric field for a charged ring. Modify the expression when z>>R and z= 0. [7] CO2

b) Derive expression for electric field due an electric dipole [5]

5. a) Find the electrical potential for (i) Point charge and for (ii) a dipole in electric field. [6] CO2

b) Find out electric potential at a point P, distance r from a charged wire of length L. [6]

CO1: Define different physical quantities. CO2: Derive various equations of elasticity, fluid motion, viscosity and surface tension; CO3: Evaluate different numerical problems