

B. Sc. in Civil Engineering
2nd semester

Date: 22 February, 2023
Time: 10:00 am - 11:30 am

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

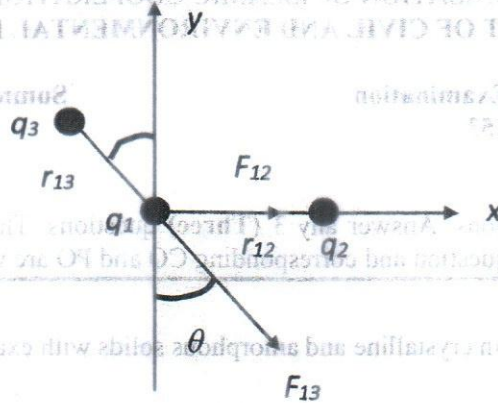
Semester Mid Semester Examination
Course Number: PHY 4253
Course Title: Physics II

Summer Semester: 2021 - 2022
Full Marks: 75
Time: 1.5 Hours

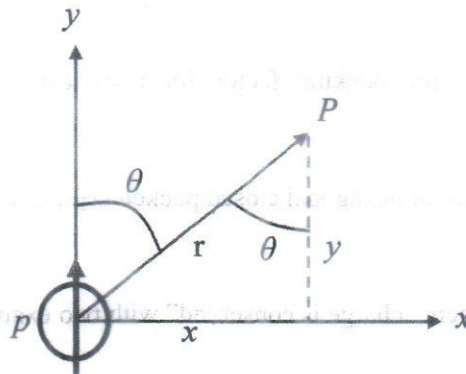
There are 4 (Four) questions. Answer any 3 (Three) questions. The symbols have their usual meanings. Marks of each question and corresponding CO and PO are written in the brackets.

1. (a) State and explain crystalline and amorphous solids with examples. (05)
(CO1)
(PO1)
- (b) Calculate the number of atoms in simple cubic, body centered cubic, face centered cubic, and hexagonal closed packed structures with proper diagram. (15)
(CO2)
(PO2)
- (c) Aluminium has fcc structure. If the density of aluminium is $2.9 \times 10^3 \text{ kg/m}^3$. Calculate the unit cell dimensions and the atomic diameter. (Atomic weight of aluminium is 27.08 and Avogadro number is $6.023 \times 10^{26} \text{ kg mole}$). (05)
(CO3)
(PO2)
2. (a) Write down the name of crystal systems and their corresponding Bravais lattice. (05)
(CO1)
(PO1)
- (b) Calculate the atomic packing factor for body centered cubic and face centered cubic lattice. (15)
(CO2)
(PO2)
- (c) Find the axial ratio of hexagonal closed packed crystal structure. (05)
(CO3)
(PO2)
3. (a) Justify the statement "charge is conserved" with two examples. (05)
(CO1)
(PO1)
- (b) (i) A ring of radius ' a ' consists of charge q . Calculate electric field E for points on the axis of the ring a distance x from its center, and (ii) an electron of mass m and charge e is projected with a speed v_0 at right angles to a uniform field E . Describe its motion. (15)
(CO2)
(PO2)

- (c) Figure below shows three charges q_1 , q_2 and q_3 . Assume that $q_1 = -1.0 \times 10^{-6}$ C, $q_2 = 3.0 \times 10^{-6}$ C, $q_3 = -2.0 \times 10^{-6}$ C, $r_{12} = 15$ cm, $r_{13} = 10$ cm, $\theta = 30^\circ$. Calculate the resultant force on q_1 . (05)
(CO3)
(PO2)



4. (a) Define electric flux and write down the Gauss's law. (05)
(CO1)
(PO1)
- (b) Figure below shows a distant point P in the field of a dipole located at the origin of an xy -coordinate system. V is given by $V = \frac{1}{4\pi\epsilon_0} \frac{pcos\theta}{r^2}$. Calculate E as a function of x and y and also as a function of r and θ . (15)
(CO2)
(PO2)



- (c) A point charge has $q = +1.0 \times 10^{-4}$ C. Consider point A which is 2.0 m distant and point B which is 1.0 m distant in a direction diametrically opposite, as in Figure below. What is the potential difference $V_A - V_B$? (05)
(CO3)
(PO2)

