**National University of Computer & Emerging Sciences, Karachi  
 Fall-2023 CS-Department  
 MID – II Exam**Fast

**8th November, 11:30 AM– 12:30 PM**

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| **Course Code: NS (1001)** | **Course Name: Applied Physics** | |
| **Instructor Names:** Mr. Javaid Qureshi , Ms. Rabia Tabassum , Mr. M. Rahim , Mr. Waqar Ahmed | | |
| **Student Roll No:** | | **Section :** |

**Instructions:**

* Attempt all questions.
* Return the question paper with your answer sheet.
* Read each question completely before answering it. There are **3 questions and 2 pages.**
* All the answers must be solved according to the sequence given in the question paper.

**Time: 60 minutes. Max Marks: 30 points**

**Question 1: Oscillations CLO - 5 [10]**

1. An oscillator consists of a block attached to a spring (k = 400 N/m). At some time, t, the position (measured from the system’s equilibrium location), velocity, and acceleration of the block are x = 0.2 m, v = -15.5 m/s, and a = -145 m/s2 Calculate (i) the frequency of oscillation, (ii) the mass of the block [4]
2. In a mass-spring system placed horizontally, the mass has a kinetic energy of 3 J and the spring has an elastic potential energy of 2 J when the block is at *x*= 2.0 cm. (i) What is the kinetic energy when the block is at *x* = 0? What is the elastic potential energy when the block is at (ii) *x* = -2.0 cm and (c) *x* = **-** *xm*? [2]
3. For a damped oscillator, *m* =260 g, *k* =84 N/m, and *b* =75 g/s. (i) what is the period of the motion? (ii) How long does it take for the amplitude of the damped oscillations to drop to one-fourth of its initial value? [4]

**Question 2: Wave Motion CLO - 6 [10]**

1. The linear density of a string is 1.6 x 10-4 kg/m. A transverse wave on the string is described by the equation **y =(0.021 m) sin[(2.0 m-1)x + (30 s-1)t].**

What are (i) the wave speed and (ii) the transverse velocity, and (iii) the transverse acceleration? [4]

1. What phase difference between two identical traveling waves, moving in the same direction along a stretched string, results in the combined wave having an amplitude 1**.**5 times that of the common amplitude of the two combining waves? [3]
2. Discuss the motion of water particles and type of water waves.(not more than 5 lines) [3]

**Question 3: Electric Force and Field CLO - 7 [10]**

1. Initially, sphere *A* has a charge of =50*e* and sphere *B* has a charge of = -20*e*.The spheres are made of conducting material and are identical in size. If the spheres then touch, what is the resulting charge on sphere *A*? [2]
2. In Fig-1 particles 1 and 2 of charges q1=q2 = +3.2 x10-19C are on a y axis st ad istance d = 17cm from the origin. Particle 3 of charge q3 = 6.4 x10-19C is moved gradually the x axis from x = 0 to x = +5m. At what values of x will the magnitude of the electroststice force on the third particle be (i) Minimum and (ii) Maximum? What are the (iii)minimum and (iv) maximum magnitudes ? [4]

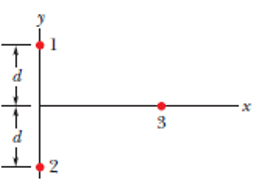


Fig -1

1. In Fig-2., the four particles are fixed in place and have charges *q*1 =*q*2= 5*e*, *q*3=3*e*, and *q*4 =12*e*. Distance *d =* 5.0 mm. What is the magnitude of the net electric field at point *P* due to the particles? (*e* = 1.6 x10-19C, k =9 x109 ) [4]

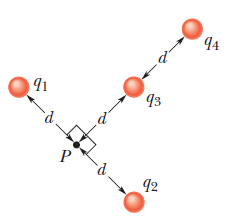


Fig-2

**Good Luck** ☺