

Course Code: EE (117)	Course Name: Applied Physics
Instructor Name / Names: Mr. Javahd Iqbal Qureshi, Ms. Rabia Tabassum, Mr. Muhammad Adeel, Ms. Sonia	
Student Roll No:	Section :

**INSTRUCTIONS:**

- 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: 60

**Question: 1 (Vectors) [15]**

1. Calculate the angle between "r" and the positive y-axis, where  $a = 6i + 2j - 6k$ ,  $b = -2i + 5j + 3k$  and  $c = 4i + 2j + 5k$ ,  $r = a + b - c$ . [4]

2. If  $\vec{A} = 2i - 6j - 3k$  and  $\vec{B} = 4i + 3j - k$ , Calculate the Area of Parallelogram. [3]

3. Find the divergence and curl of  $G(x,y,z) = x^2 i + 2yz j + yk$  at the point (1, -2, -1). [8]

**Question: 2 (Motion) [25]**

1. The position of a particle moving in a straight line is given by  $X = 5 + 2t + 4t^2 - t^3$ , where "x" is in meter and "t" is in second. (a) Find an expression for the velocity and acceleration as a function of time. (b) Find the position, velocity, and acceleration of the particle at  $t = 2$  sec. [5]

2. (a) Which of the velocity component retains its initial value throughout the flight (in projectile motion) and why? (b) As a projectile moves in its parabolic path, is there any point along the path where the velocity and acceleration vectors are perpendicular to each other? [4]

3. Following figure-1 shows the speed - time graph for a journey of a boy from his house to school. Look at the shape of the graph and describe the type of motion in each stage. [5]

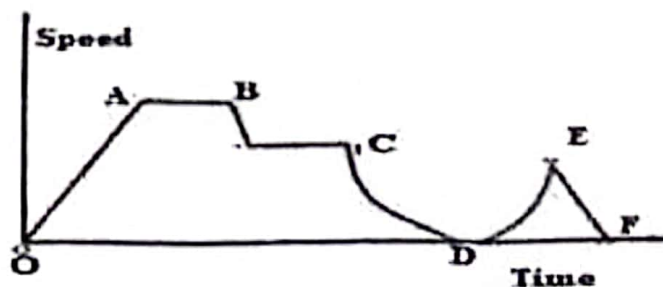


Fig-1

4. With the help of the following Position - time graph (Fig-2), draw velocity versus time ( $v_x$  vs  $t$ ) and acceleration versus time ( $a_x$  vs  $t$ ) graphs. [5]

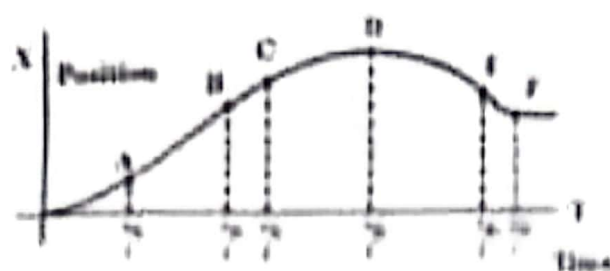


Fig-2

2. A stone is thrown from the top of a building upward at an angle of  $30^\circ$  to the horizontal and with an initial speed of  $20 \text{ m/s}$ , as in figure-1. If the height of the building is  $45 \text{ m}$ . How long is the stone "in flight" [6]

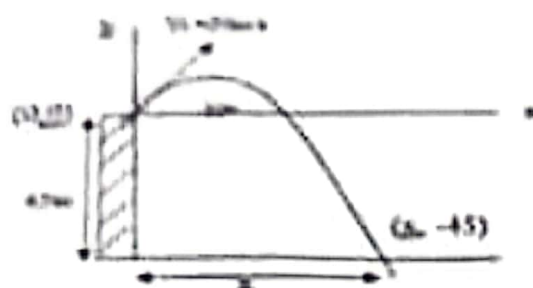


Fig-3

### Question: 3( Force Laws)[201]

1. Why a person feels heavier in the upward and lighter in the downward motion of elevator? [2]
2. You press your physics textbook flat against a vertical wall with your hand. What is the direction of the friction force exerted by the wall on the book? Explain your answer. [2]
3. In the following Fig-4, a block of mass  $= 3.0 \text{ kg}$  slides along a floor while a force  $F$  of magnitude  $12.0 \text{ N}$  is applied to it at an upward angle  $\theta = 45^\circ$ . The block goes from rest to a velocity of  $0.2 \text{ m/sec}$  in  $0.5 \text{ sec}$ . Assuming constant acceleration, what is the force of friction? [8]

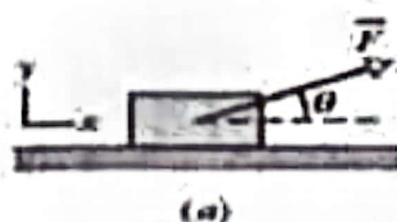


Fig-4

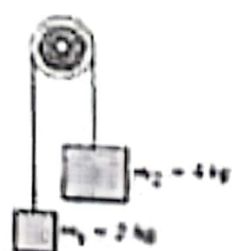


Fig-5

4. Masses of  $2 \text{ kg}$  and  $4 \text{ kg}$  connected by a chord are suspended over a frictionless pulley are shown in Fig-5. What is the acceleration of masses when released? [8]

**GOOD LUCK**