

Course Code: EE (117)	Course Name: Applied Physics
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Instructions:

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

Time: 60 minutes.

Max Marks: 40 points

Question: 1(Vectors)[15]

- Find the angle between the vectors  $A = 2i - 3j + 5k$  and  $B = 4i + 2j + 5k$ . [3]
- Can a scalar quantity be a negative quantity? Give example [2]
- Prove that two vectors must have equal magnitude if their sum is perpendicular to their difference [3]
- Find the area of the triangle with adjacent sides  $A = 3i - 2j + 4k$  and  $B = -i - 4j + 2k$  [3]
- A heavy piece of machinery is raised by sliding it 25 m along a plank oriented at  $35^\circ$  to the horizontal, as shown in Fig - 1. (a) How high above its original position is it raised? (b) How far is it moved horizontally? [4]

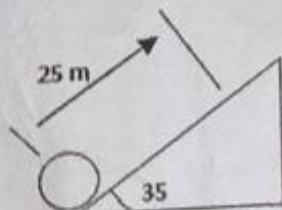


Fig-1

Question: 2( Motion) [15]

- Find the angle of the projectile if the maximum height and range of the projectile are equal. [4]
- The position of a particle moving in an XY direction is given by

$$r = [2t^3 - 5t]i + [6 - 7t^4]j$$

where "x" is in meter and "t" is in second. Find an expression for the velocity and acceleration as a function of time. [2]



- c. You have most likely had the experience of standing in an elevator that accelerates upward as it moves toward a higher floor. In this case, you feel heavier. Are you heavier, or there is something apparently increased? Explain your answer. [2]
- d. Let "v" and "a" represent the velocity and acceleration, respectively, Describe circumstances in which (a) "v" and "a" are parallel (b) "v" and "a" are perpendicular (c) "v" and "a" are anti parallel [3]
- e. Only draw the graphs of velocity, acceleration and position of a car that starts at rest, accelerates for an interval, then moves with constant velocity, and then brakes with negative acceleration to rest again. [4]

**Question: 3 (Force Laws) [10]**

- a. Explain, why the coefficient of static friction is always greater than coefficient of kinetic friction for a given pair of surface? [1]
- b. How does Newton's 2nd law relate to the force of gravity? [2]
- c. Consider two bodies of different mass moves towards Earth surface by neglecting air friction, which body reached at Earth surface earlier than the other one? Give explanation. [2]
- d. Find the tension and acceleration in the system if a block of mass 9.5 kg slides on a surface inclined at an angle of 34. The block is attached by a string to a second block of mass 2.6 kg which is hanging vertically. Coefficient of friction between the surface and block is 0.3. Also find the normal force on the block. [5]

**GOOD LUCK**