

# PURBANCHAL UNIVERSITY

2023

B. E. Computer/Electrical/Second Semester/Final

Time: 03:00 hrs.

Full Marks: 60 /Pass Marks: 24

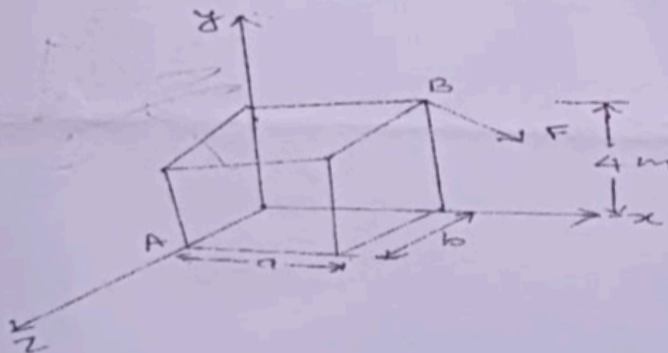
**BCI2003: Applied Mechanics (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

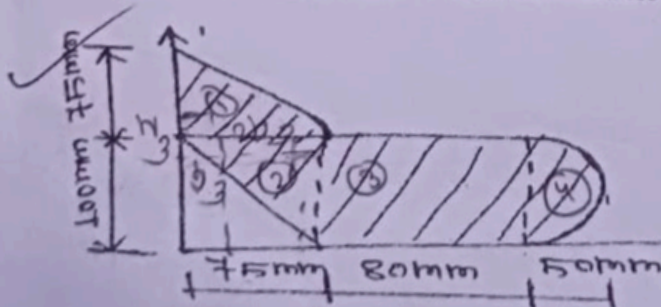
Attempt ALL questions.

1. Mention the fundamental concepts and principle of mechanics? 4
- 2(a) Describe Lami's theorem? List out the different types of forces? 3+1
- (b) The moment of the force  $\vec{F} = (2i - 3j + 4k)$  acting at B about point A is given by  $\vec{M} = (-3i + 7j - 12k)$ . Determine the dimension 'a' and 'b' of the rectangular box as shown in figure below. 10



$$I_{zz} = I_{xx} + I_{yy}$$

- 3(a) State and prove perpendicular axis theorem? 2
- (b) Compute the moment of inertia about centroidal X and Y axis. 6



4. What do you mean by friction & state the Law of friction. Mention the condition of sliding? 1+3+2

Contd. ...

5(a) Derive the expression for equation of motion for a particle moving along a rectilinear path when the acceleration is given function of velocity. 4

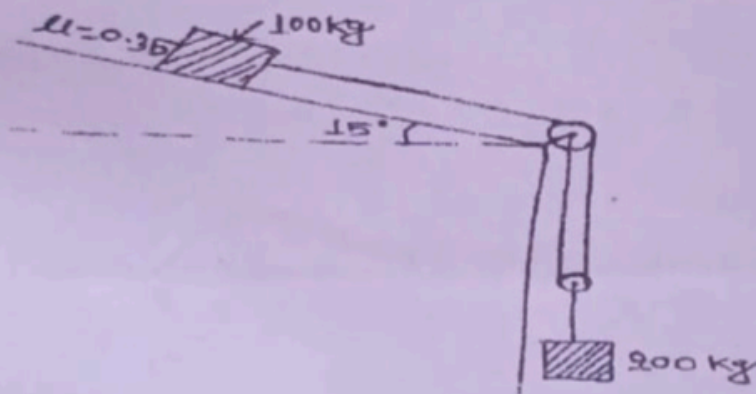
(b) The acceleration of the particle is defined by the relation  $a=21-12x^2$ , where  $a$  is expressed in  $m/sec^2$  and  $x$  is in meter, the particle starts no initial velocity at the Position  $x=0$ . Determine: 6

- (i) The velocity when  $x=1.5m$ .
- (ii) The position where velocity is again zero.
- (iii) The position where velocity is maximum.

$$v = \frac{dx}{dt}$$

6(a) Describe the angular momentum in brief? 2

(b) Two blocks as shown in fig. Starts from rest. The pulleys are friction less having zero mass. The kinetic coefficient of friction is 0.35, determine the acceleration of each blocks & tension in the cord. 6



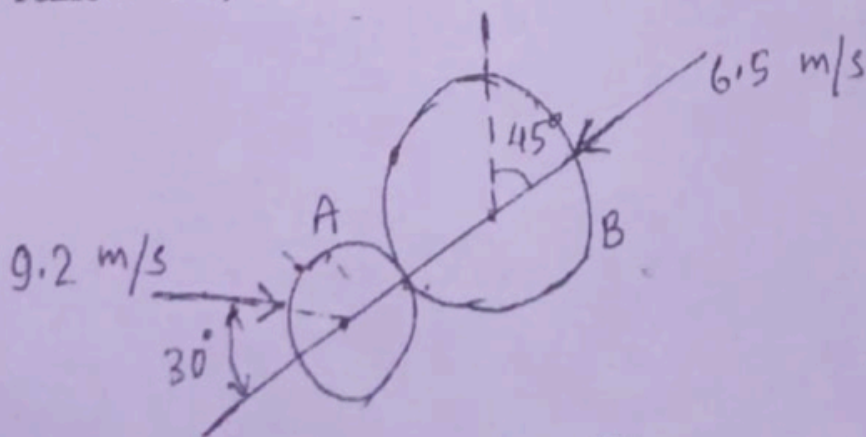
$$a = v \cdot \frac{dv}{dx}$$

$$v = \frac{dx}{dt}$$

$$dx = v \cdot dt$$

7(a) Illustrate the potential and kinetic energy of a particle? 4

(b) The initial velocities and their directions of the balls are as shown in figure. Determine the final velocities and the direction after impact. Take  $e=0.8$ , mass of ball A=450g. mass of ball B=890g. 6



$$F = ma = m \cdot \frac{dv}{dt}$$

$$x = vt$$