



Part I: Statics (35 marks)

Answer the following questions

(Question 1): (13 marks)

- For the hinged beam shown in Fig. 1. Find the value of w t/m if the maximum positive bending moment in the section C-D is 2.25 m.t. and then determine the components of reactions at supports A, B, and C. Draw the normal force, shear force and bending moment diagrams for the given beam.

(Question 2): (12 marks)

- For the given simple frame, if the components of reactions at supports A, and B are as shown in Fig. 2 Draw the normal force, shear force and bending moment diagrams.

(Question 3): (10 marks)

- Determine the position of the centroid (X_o, Y_o) with respect to X_1 and Y_1 axes and the value of principal moments of inertia (I_{X_o}, I_{Y_o}) for the given section shown in Fig. 3.

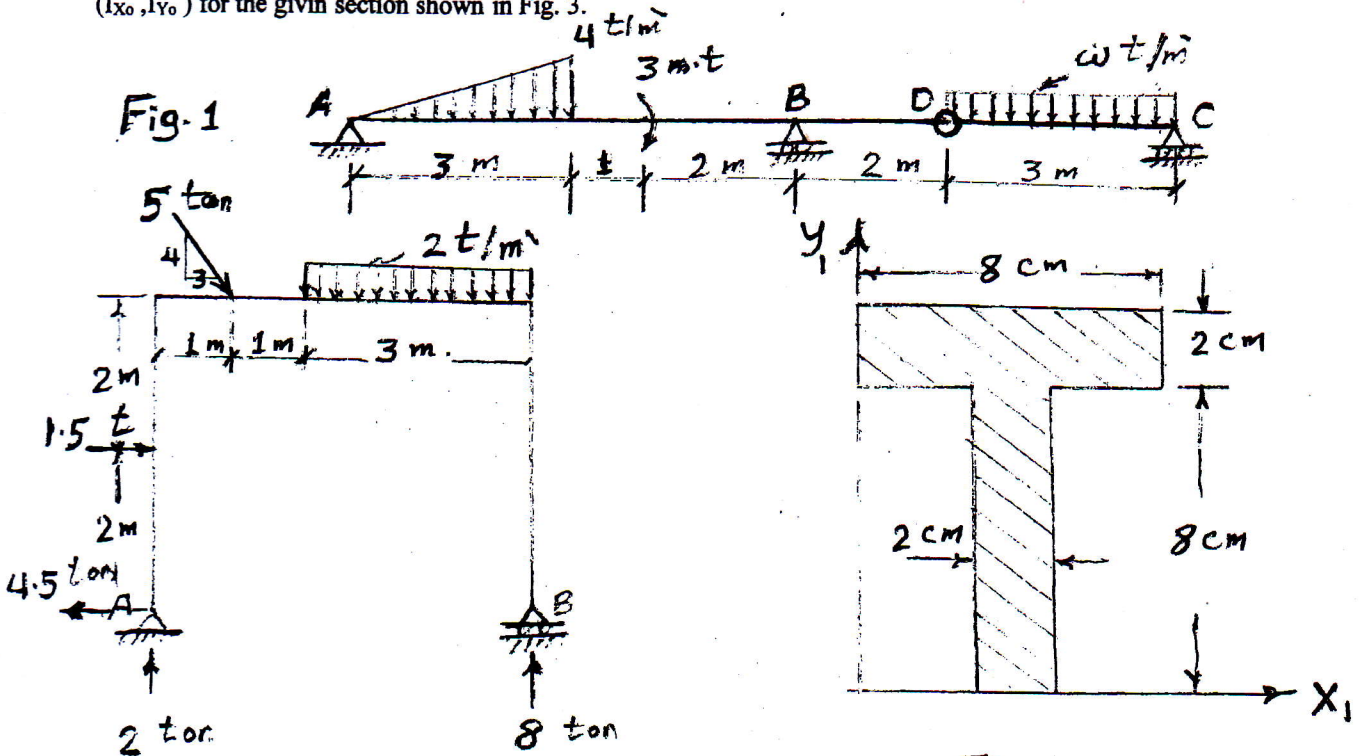


Fig. 2

Fig. 3

This exam contributes "by measuring ILOs" in achieving Programme Academic Standards according to NARS

Question Number	Q1	Q2	Q3		Q1		Q2		Q1	Q2			
	a5-1,2		a15-2		b1-1		b1-1		c1-1	c1-1			
Skills	Knowledge & Understanding Skills				Intellectual Skills				Professional Skills				

PART 2 (Dynamics):

Question (1):- [10 marks]

- a- What is Newton's law of gravitational attraction. (2 marks)
- b- The two blocks shown in Fig.(1) start from rest. The horizontal plane and the pulley are frictionless, and the assumed to be of negligible mass.
Determine the acceleration of each block and the tension in the cord. (8 marks)

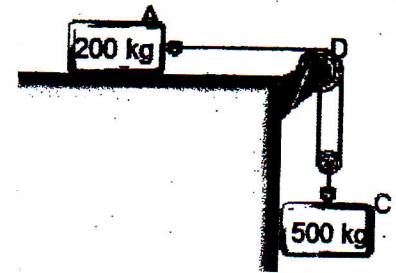
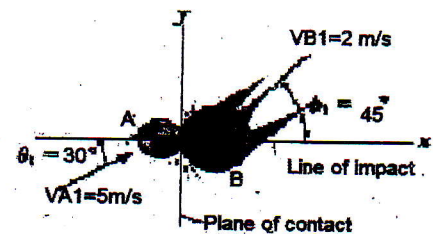


Fig.(1)

Question (2):- [10 marks]

- a- What's the main difference in work and energy methods when they are applied to problems involving rigid bodies as opposed to when they are applied to problems involving particles? (2 marks)
- b- Two smooth disks A and B, having a mass of 2 kg and 4 kg, respectively, collide with the velocities shown in Fig.(2). If the coefficient of restitution for the disks is $e=0.75$.

Determine the x and y components of the final velocity of each disk just after collision. (8 marks)



Fig(2)

Question (3):- [10 marks]

- a- What are the three types of rigid body planar motion. Give a short description of each. (2 marks)
- b- In Fig. (3) If $x = 50$ mm and $v_c = 4$ m / sec to left
Find (by using two methods) :-
The angular velocity of link AB (8 marks)

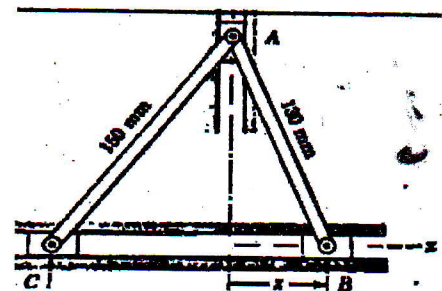


Fig.(3)

Question (4):- [10 marks]

- a- Define the angular momentum of a particle about a point O. (2marks)
- b- The system is at rest when a moment $M=6$ Nm is applied to gear B.
Neglecting friction, Fig (4).
a) Determine the number of revolutions of gear B before its angular velocity reaches 600 rpm, and (4marks)
b) Tangential force exerted by gear B on gear A. (4marks)

$$m_A = 10 \text{ kg} \quad k_A = 200 \text{ mm}$$

$$m_B = 3 \text{ kg} \quad k_B = 80 \text{ mm}$$

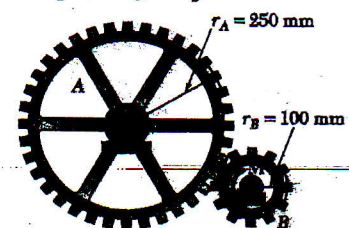


Fig.(4)

With our best wishes

This exam contributes "by measuring" in achieving Programme Academic Standards according to NARS												
Question Number	Q1-a	Q2-a	Q3-a	Q4-a	Q1-b	Q2-b	Q3-b	Q4-b	Q1-b	Q3-b	Q4-b	
	a1-1	a19-1	a15-2	a5-1	b16-1	b17-1	b1-1	b16-1	c13-1	c14-1	c13-1	
Skills	Knowledge & Understanding Skills				Intellectual Skills				Professional Skills			