



	WINTER-2023		
	Exam Seat No.:		
	Academic Year:2023-2024	Semester:I	
	Name of Programme:B.Tech	Pattern:2023	
	Name of Course:Engineering Mechanics	Course Code:2300113A	
	Max. Marks:60	Duration:2.50	

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 6 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome

Question No. 1 Attempt following Question

- 1 Calculate the magnitude, direction and position of resultant of the force system with respect to A as (6) CO2 shown in Fig. 1

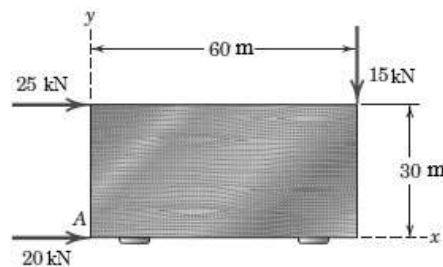


Fig. 1

Question No. 2 Attempt following Question

- 2 Calculate reactions at fixed supports A for the beam shown in fig. 2 (6) CO3

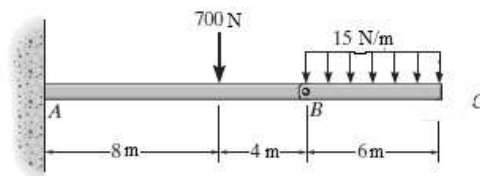


Fig. 2

Question No. 3 Attempt following Question

3.a) Locate the centroid of the shaded region shown in fig. 3a .All dimensions are in mm

(6) CO4

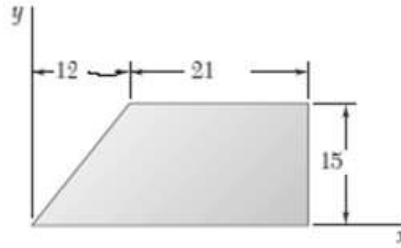


Fig. 3a

OR

3.b) Locate the centroid of the shaded region shown in fig. 3b

(6) CO4

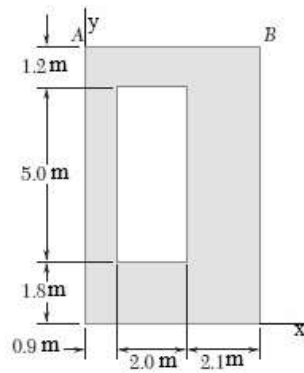


Fig. 3b

3.c) Locate the y component of centroid for the fig. 3(c) as shown below

(5) CO4

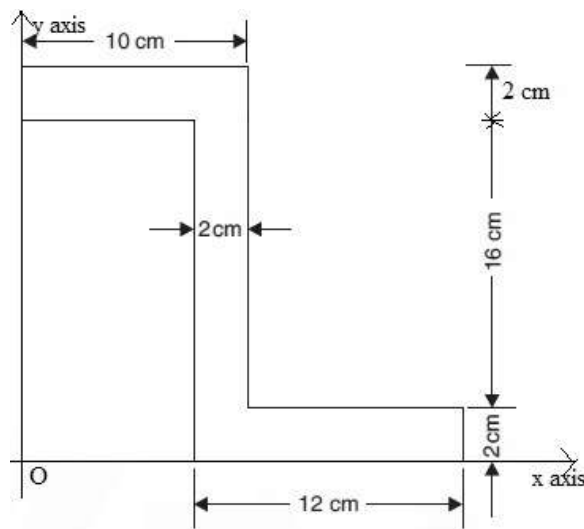


Fig. 3c

OR

3.d) Calculate moment of inertia with respect to X axis for the fig. 3d shown below

(5) CO4

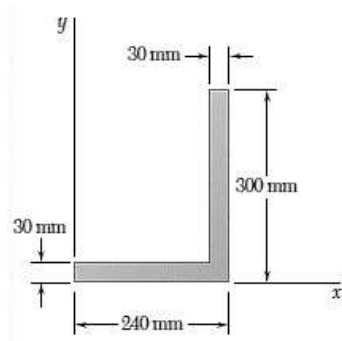


Fig. 3d

3.e) Calculate moment of inertia with respect to X axis shown in fig. 3e

(5) CO4

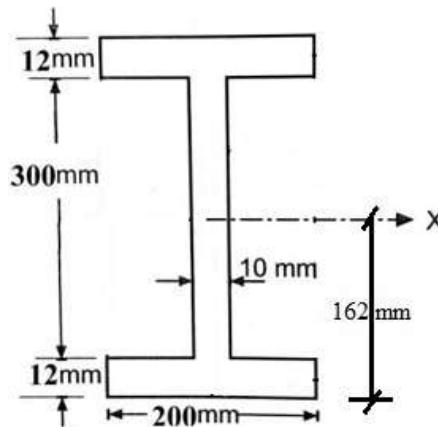


Fig. 3e

OR

3.f) Calculate moment of inertia with respect to X axis at the bottom of the web as shown in fig. 3f

(5) CO4

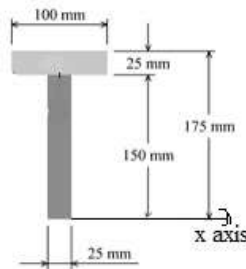


Fig. 3f

Question No. 4 Attempt following Question

4.a) A body of weight 300 N is lying on a rough horizontal plane as shown in fig. 4a having a coefficient of friction as 0.3. Find the magnitude of the force P, which can move the body, while acting at an angle of 25° with the horizontal. (6) CO3

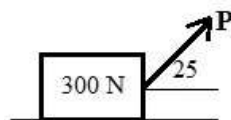


Fig. 4a

OR

- 4.b) A body of weight 500 N is lying on a rough plane inclined at an angle of 25° with the horizontal. It is supported by an effort (P) parallel to the plane as shown in Fig. 4(b). Determine the value of P, for which the equilibrium is maintained, if the coefficient of friction is 0.3. (6) CO3

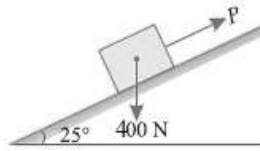


Fig. 4b

- 4.c) Determine the force P required to (a) raise and (b) lower the 40-kg cylinder at a slow steady speed as shown in fig. 4c. The coefficient of friction between the cord and its supporting surface is 0.30. (5) CO3

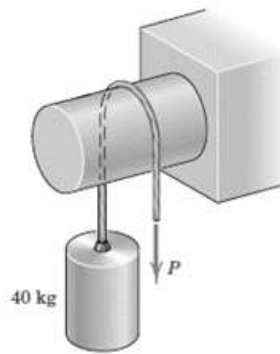


Fig. 4c

OR

- 4.d) A uniform ladder 5 m long, weighing 250 N, is placed against a smooth vertical wall with its lower end 2 m from the wall as shown in fig. 4d. Determine the coefficient of friction between the ladder and floor if the ladder is in equilibrium in this position. (5) CO3

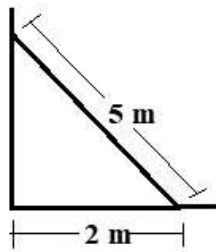


Fig. 4d

- 4.e) What is static and coefficient in kinetic friction? Write the relation between coefficient of static and kinetic friction. (5) CO3

OR

- 4.f) What is wedge friction? Explain the concept with suitable Free Body Diagram (5) CO3

Question No. 5 Attempt following Question

- 5.a) The crate has a mass of 80 kg and is being towed by a chain which is always directed at 20° from the horizontal as shown in fig. 5a. Determine the acceleration of the crate if the coefficient of (6) CO5

kinetic friction is 0.3 and the towing force is $P = 360 \text{ N}$.

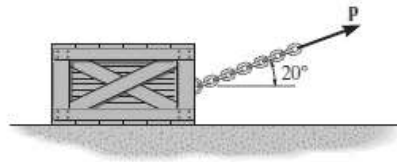


Fig. 5a

OR

- 5.b) If the motor M exerts a constant force of 300 N on the cable as shown in fig. 5b, determine the acceleration of the 20-kg crate when it travels up the plane, starting from rest. The coefficient of kinetic friction between the crate and the plane is $\mu_k = 0.3$. (6) CO5

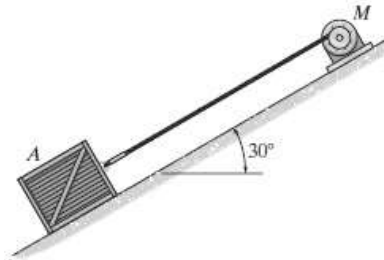


Fig. 5b

- 5.c) The freight cars A and B have a mass of 20 Mg and 15 Mg respectively. The freight cars are initially moving with velocities as shown in fig. 5(c). Determine the velocity of A after collision and the coefficient of restitution if the cars collide and rebound, such that B moves to the right with a speed of 2 m/s . (5) CO5

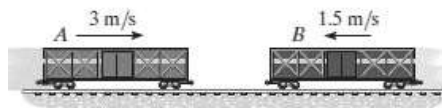


Fig. 5c

OR

- 5.d) If the constant force of 300 N is pulling the crate as shown in fig. 5d, determine the speed of the 20-kg crate when it travels $s = 10 \text{ m}$ up the plane, starting from rest. The coefficient of kinetic friction between the crate and the plane is $\mu_k = 0.3$. (5) CO5

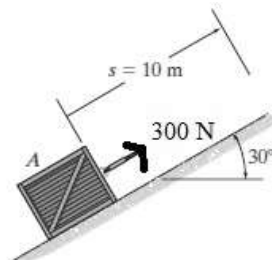


Fig. 5d

- 5.e) Define following terms (5) CO5
- Work

- ii. Power
- iii. Energy
- iv. Potential energy
- v. Kinetic energy

OR

- 5.f) Define coefficient of restitution and mention its range for a) perfectly plastic impact, b) perfectly elastic impact and c) semi plastic impact (5) CO5