



SUMMER-2024	
Exam Seat No.:	
Academic Year:2023-2024	Semester:I/II
Class:FY	Program:B.Tech
Branch Code:FYE	Pattern:2022
Name of Course:Engineering Mechanics	Course Code:FYE221009
Max. Marks:60	Duration:2.30 Hrs.

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 ____ 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 column indicates the Course Outcome

Question No. 1 Attempt following Question

- 1 A 100 kg cylinder is attached to the cable BC as shown in the fig. 1. Determine the reaction at A and (6) CO2 tension in cable BC.

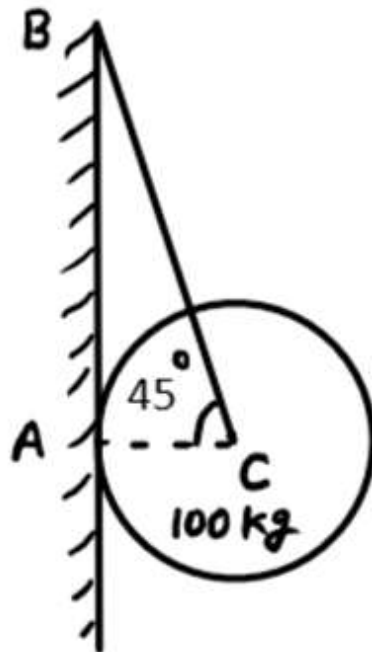


Fig.1

Question No. 2 Attempt following Question

- 2 Determine the reactions at the support A and B of the beam loaded and supported as shown in the fig. 2. (6) CO3

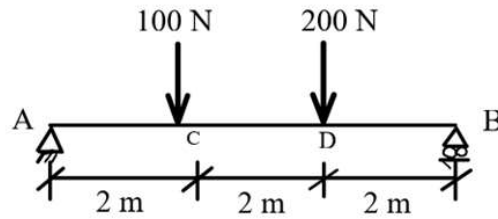


Fig. 2

Question No. 3 Attempt following Question

- 3.a) Determine the y coordinate of centroid from point O for the unequal I – section shown in the fig. 3a. (6) CO4

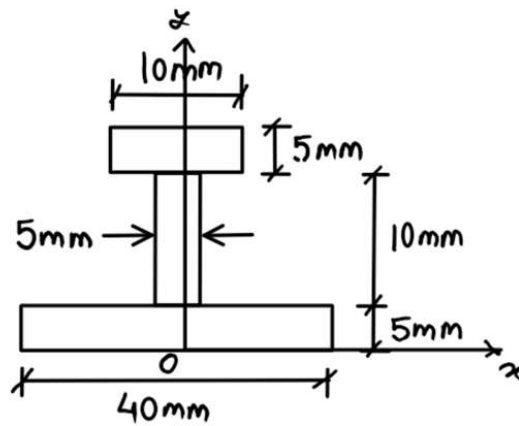


Fig. 3a

OR

- 3.b) Determine the x coordinate of the centroid for the shaded area shown in the fig. 3b (6) CO4

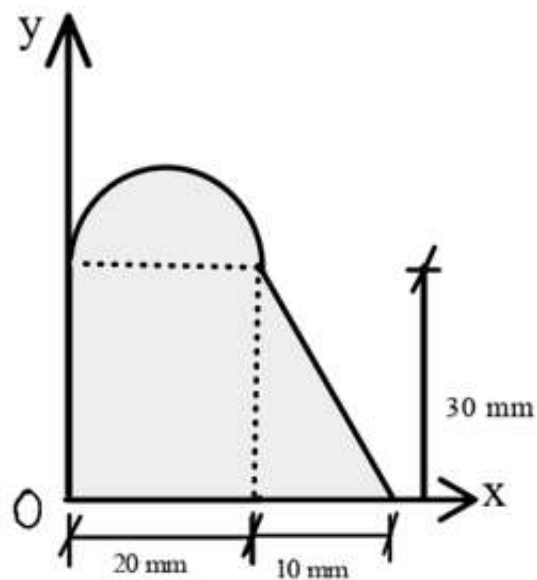


Fig. 3b

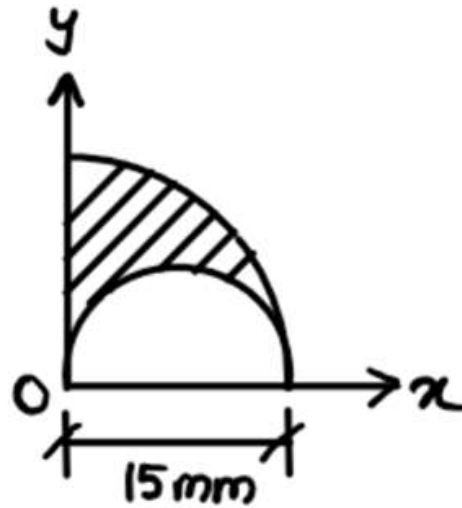


Fig. 3c

OR

3.d) Determine the y coordinate of the centroid of a T – section shown in fig. 3d.

(5) CO4

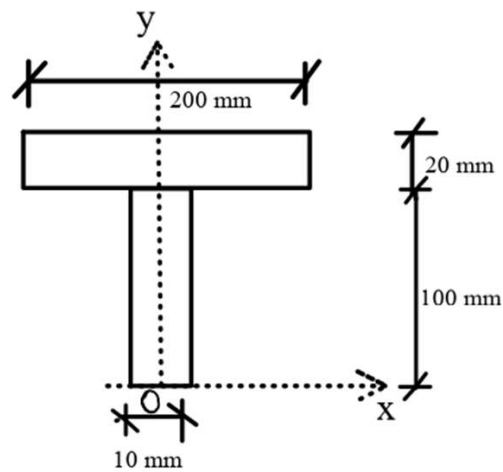


Fig. 3d

3.e) Calculate the area moment of inertia I_{xx} of an L – section shown in fig. 3e, with one leg as 150 mm x 20 mm other leg as 150 mm x 30 mm, about its centroidal x - axis. Then centroid of the L – section lies at 52.39 mm from bottom.

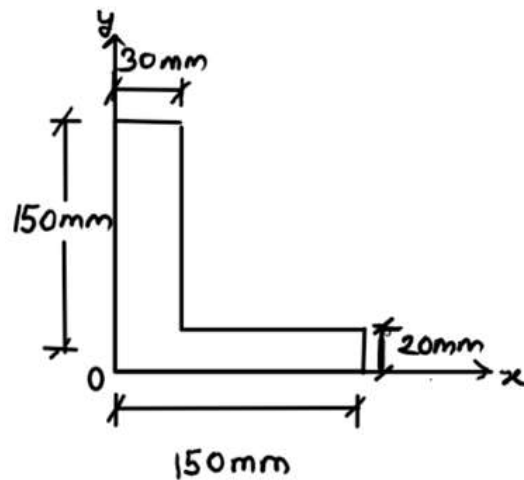


Fig. 3e

OR

- 3.f) Calculate the area moment of inertia, I_{xx} , of the shaded area as shown in fig. 3f, about its centroidal (5) CO4 axis. The centroid of the area (y) is at 40 units from bottom.

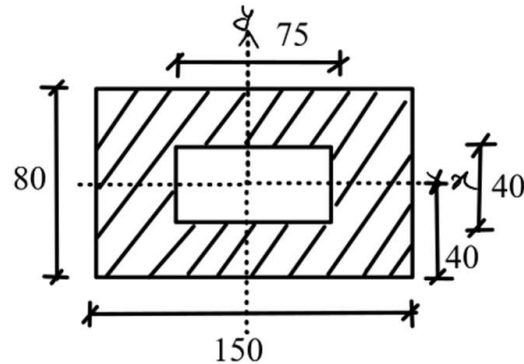


Fig. 3f

Question No. 4 Attempt following Question

- 4.a) A block of weight 1500 N is placed on the rough surface as shown in fig. 4a. A force P of 800 N, is (6) CO3 applied to the block such that the block just starts to move in the direction of the force. Determine the value of coefficient of friction between the block and the surface.



Fig. 4a

OR

- 4.b) A block of weight 350 N is kept on a rough inclined plane. The plane makes an angle of 20° to the (6) CO3 horizontal and a force P is applied to the block as shown in the fig. 4b. Determine the value of force P so that the block just starts to move upwards. Take $\mu = 0.2$.

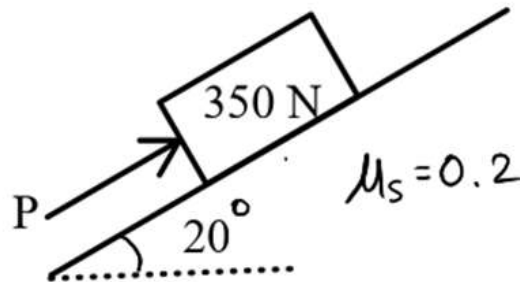


Fig. 4b

- 4.c) A ladder of length 6 m is kept inclined with the ground. The weight of the ladder is 1300 N as (5) CO3 shown in fig. 4c. A man of weight 843 N moving up the ladder. Determine the distance of the man from point A, at which the ladder slips. Take coefficient of static friction = 0.3 at point of contact A and consider wall surface at B as smooth.

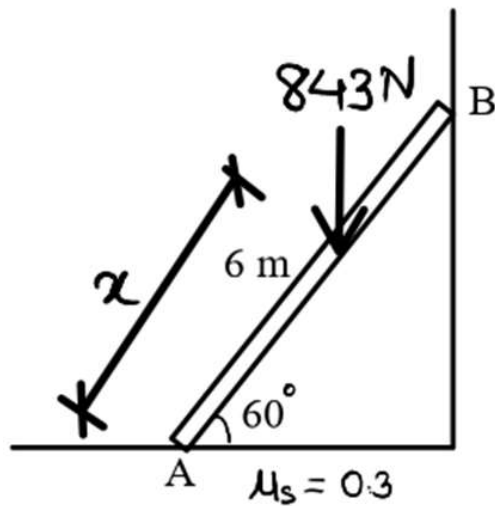


Fig. 4c

OR

- 4.d) A ladder of length 10 m is kept inclined with the ground as shown in fig. 4c. A man of weight 700 N (5) CO3 moving up the ladder. Determine the distance of the man from point A, at which the ladder just start to slip. Take coefficient of static friction = 0.3 at point of contact A and consider wall surface at B as smooth. Neglect the weight of the ladder.

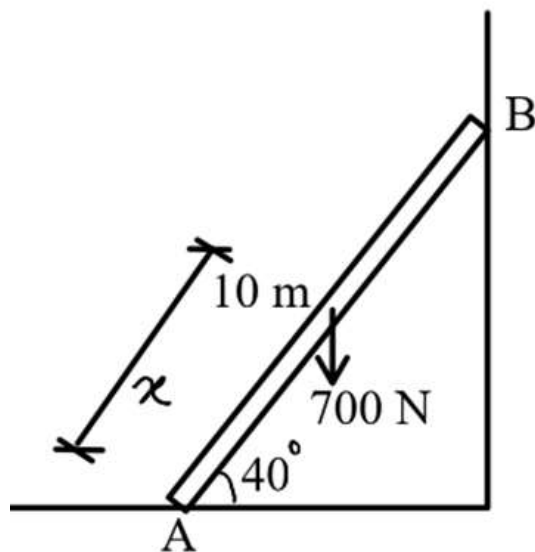


Fig. 4d

- 4.e) A cable is passing over the disc at a lap angle of 480° as shown in fig. 4e. If a force T_1 of 200 N is (5) CO3 applied at one end of the rope to keep the weight at the other end to be in equilibrium, determine the minimum value of T_2 to maintain equilibrium. Take $\mu_s = 0.3$.

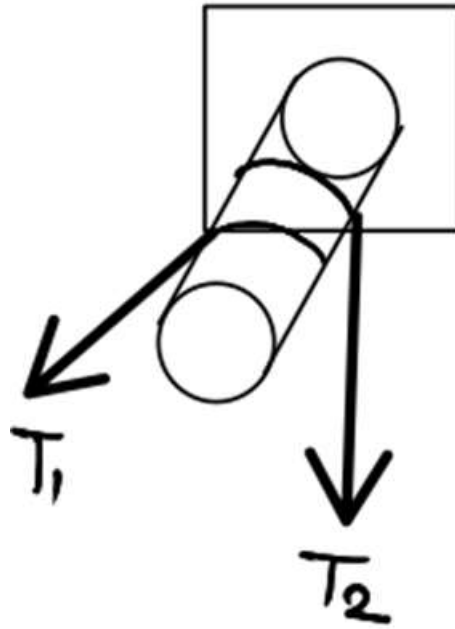


Fig. 4e

OR

- 4.f) A rope tied to a bucket is passing over a drum as shown in the fig. 4f. If the weight of the bucket is 1000 N, and the angle of lap is 480° , determine the range force T_1 so that equilibrium is maintained. Take $\mu_s = 0.3$. (5) CO3

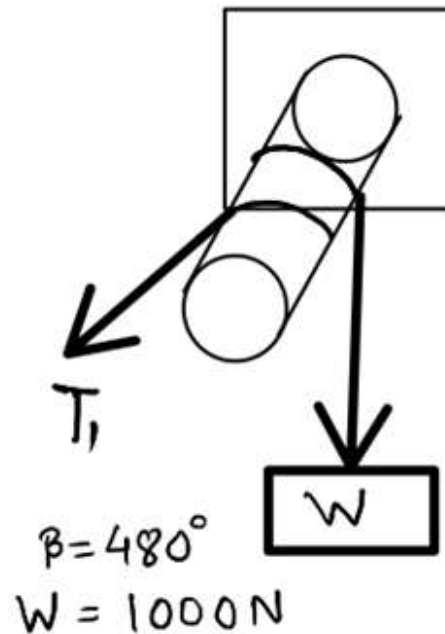


Fig. 4f

Question No. 5 Attempt following Question

- 5.a) Differentiate between plastic and elastic impact

(6) CO5

OR

- 5.b) Derive Impulse – Momentum principle.

(6) CO5

- 5.c) A block of weight 2000 N rests on a rough horizontal surface ($\mu = 0.2$) and is pulled by a force of 800 N applied at an angle of 30° to the horizontal as shown in fig. 5c. Determine the velocity attained by the block after it has moved 20 m starting from rest (5) CO5

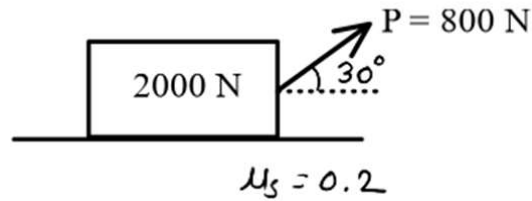


Fig. 5c

OR

- 5.d) A ball of mass 175 gm is moving with a speed of 36 km/hr. Determine the average force will be required to stop the ball in 0.2 seconds using impulse momentum principle. (5) CO5
- 5.e) A ball is dropped from a height 4 m on a smooth floor, and it rebounds twice as shown in the fig. 5e. If the height attained after 2nd bounce is 1.636 m, determine the h_1 – height after first bounce of the ball and the coefficient of restitution between ball and the floor (5) CO5

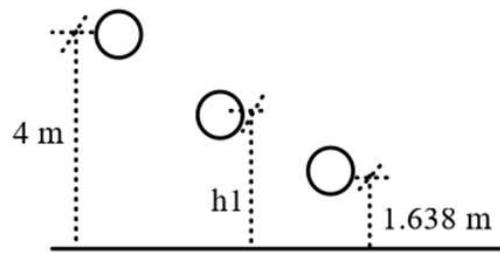


Fig. 5e

OR

- 5.f) A 10 kg cylinder moving at speed of 20 m/s towards left collides with a 10 kg car moving at a speed of 10 m/s in the same direction as shown in the fig. 5f. If after collision, the cylinder obtains 10 m/s, determine the velocity of car after collision and proceed to find coefficient of restitution between the both the bodies. (5) CO5

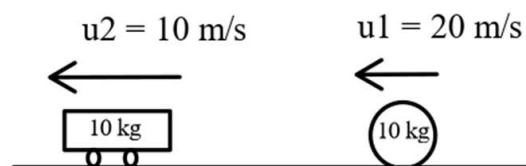


Fig. 5f

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