



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2024	
Exam Seat No.:	
Academic Year:2024-2025	Semester:I/II
Class:FY	Program:B.Tech
Branch Code:FYE	Pattern:2023
Name of Course:Engineering Mechanics	Course Code:2300113A
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 six pages.
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

Marks CO

Question No. 1

- 1 Four forces 10 N, 20 N, 30 N, 40 N act at origin as shown in the fig. 1. Determine the magnitude and the direction of the resultant force of given force system as shown in fig 1. (6) CO1

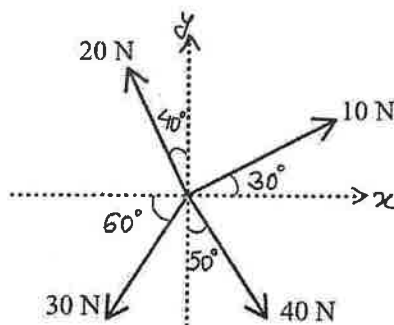


Fig.1

Question No. 2

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

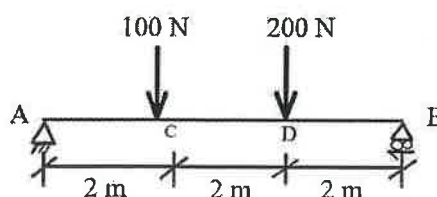


Fig. 2

- Question No. 3 a) Determine the y coordinate of centroid from point O for the section shown in fig 3.a)

Noted
18
20/01/2025

— श्रीराम

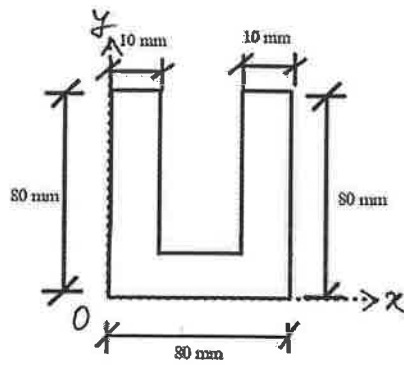


Fig. 3a

OR

- 3.b) Determine the x coordinate of the centroid for the area with respect to point O shown in the fig. 3b. (6) CO4

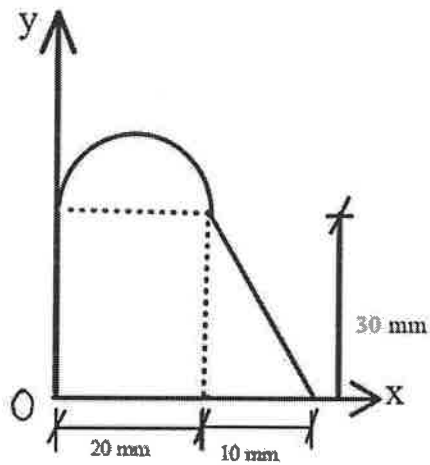


Fig. 3b

- 3.c) Determine the x and y coordinate of the centroid of the shaded area shown in the fig. 3c. All dimensions are in mm (5) CO4

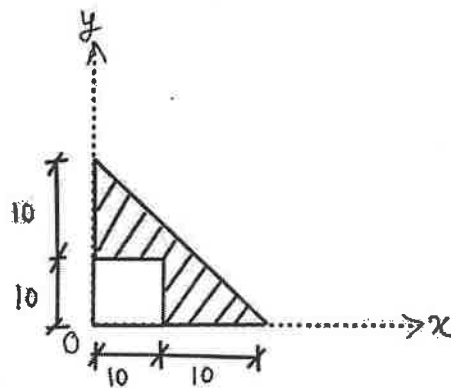


Fig. 3c

OR

- 3.d) Determine the y coordinate of the centroid of a T-section shown in fig. 3d. (5) CO4

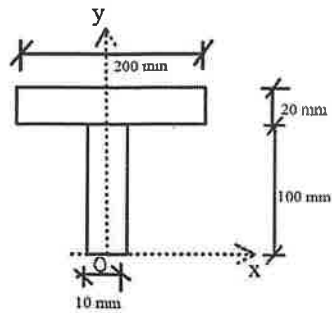


Fig. 3d

- 3.e) Calculate the area moment of inertia I_{xx} of an C – section shown in fig. 3e, with size as 150 mm x 115 mm with thickness of 20 mm, about its centroidal x - axis. The centroid of the C – section lies at 57.5 mm from bottom. (5) CO4

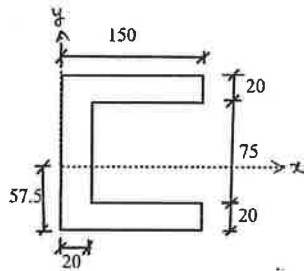


Fig. 3e

OR

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

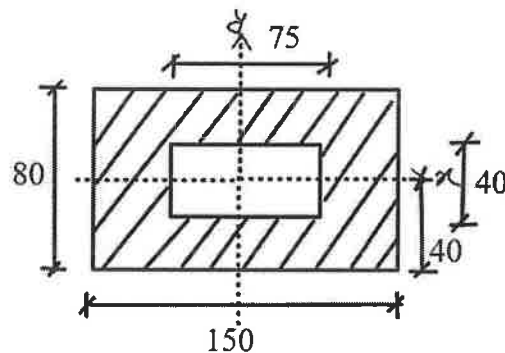


Fig. 3f

Question No. 4

- 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 inclined at 30° with horizontal, is 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. (6) CO3

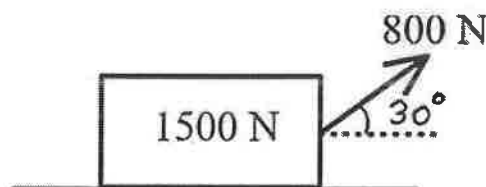


Fig. 4a

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 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 $\mu = 0.2$. (6) CO3

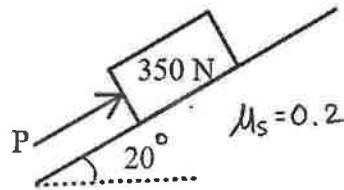


Fig. 4b

- 4.c) A uniform ladder of length of 7 m and weighing 1000 N is placed against a smooth vertical wall at an angle 30° with horizontal. A force P is applied at point B to prevent ladder from slipping. Determine the value of force P if the ladder just starts to slip. Take coefficient of friction between ladder and floor as 0.3. (5) CO3

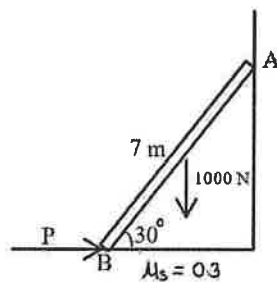


Fig. 4c

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 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 for ground surface and consider wall surface as smooth. Neglect the weight of the ladder. (5) CO3

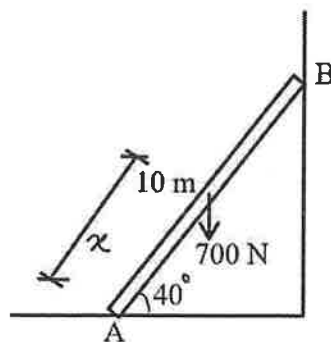


Fig. 4d

- 4.e) A cable is passing over the disc at a lap angle of 810° as shown in fig. 4e. If a force T2 of 100 N is applied at one end of the cable such that the system is in equilibrium, determine the maximum value of T1 to maintain equilibrium. Take $\mu_s = 0.3$. (5) CO3

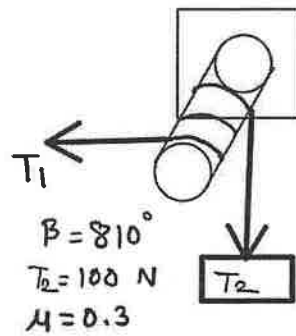


Fig. 4e

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

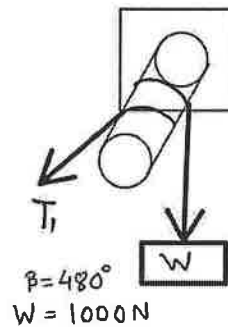


Fig. 4f

Question No. 5

- 5.a) Define the following impacts:

(6) CO5

1. Central Impact
2. Direct Impact
3. Oblique Impact
4. Eccentric Impact
5. Direct Central Impact
6. Oblique Eccentric Impact

OR

- 5.b) Derive Impulse – Momentum principle.

(6) CO5

- 5.c) A block of weight 40 kg is moving with a velocity of 3m/s on a rough horizontal surface ($\mu = 0.2$) as shown in fig. 5c. Determine the velocity attained by the block after it has moved 16 m down the plane.

(5) CO5

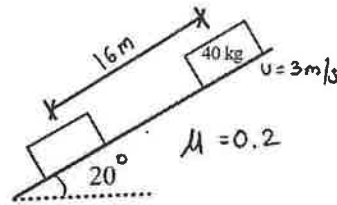


Fig. 5c

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. (5) CO5
- 5.e) A ball is dropped from a height 5 m on a smooth floor, and it rebounds twice as shown in the fig. 5e. (5) CO5
If the coefficient of restitution is 0.8 between the ball and the floor, determine the h_2 – height after second bounce of the ball.

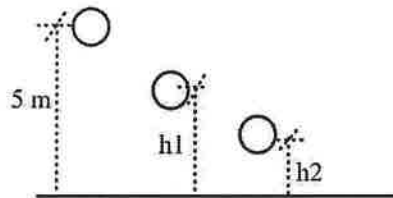


Fig. 5e

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

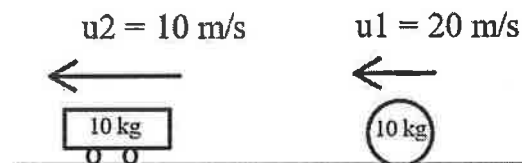


Fig. 5f

..... End of question paper.....