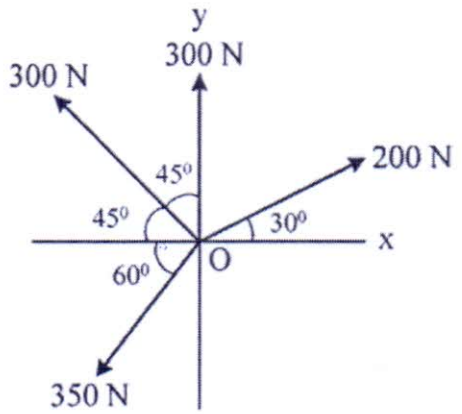
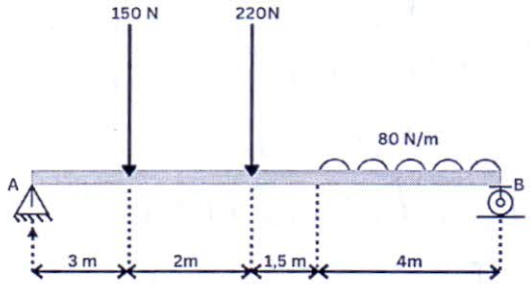
K. K. Wagh Institute of Engineering Education and Research, Nashik
(An Autonomous Institute from A. Y. 2022-23)

End-Sem Examination- Winter 2025

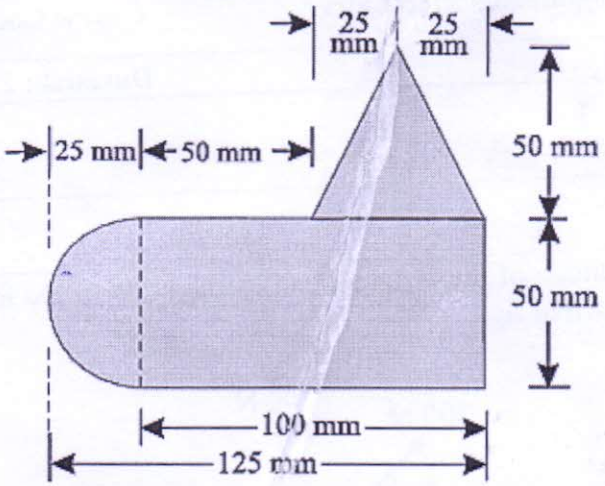
Marking Scheme Set-1

Academic Year: 2025-26	**Semester: I**
Name of Programme: First year engineering	**Pattern: 2022**
Name of Course: Engineering Mechanics	**Course Code: FYE221009**
Max. Marks: 60	**Duration: 2:30Hr.**

Q. No.	Details	Max. Marks
Q.1	Find the magnitude of the resultant and its direction of the following forces acting at a point O as shown in fig.  • Resolution of force system — 1 mark • Σfx and Σfy — 2 mark • Resultant & direction — 3 marks.	[6]
Q.2	Find support reaction at A and B for the beam AB as shown in fig.  	[6]

- Free Body Diagram (FBD) — 1 mark
- Equilibrium Equations — 2 mark.
- Support Reaction R_A & R_B — 8 mark.

a) Locate the centroid of the shaded region shown in fig.

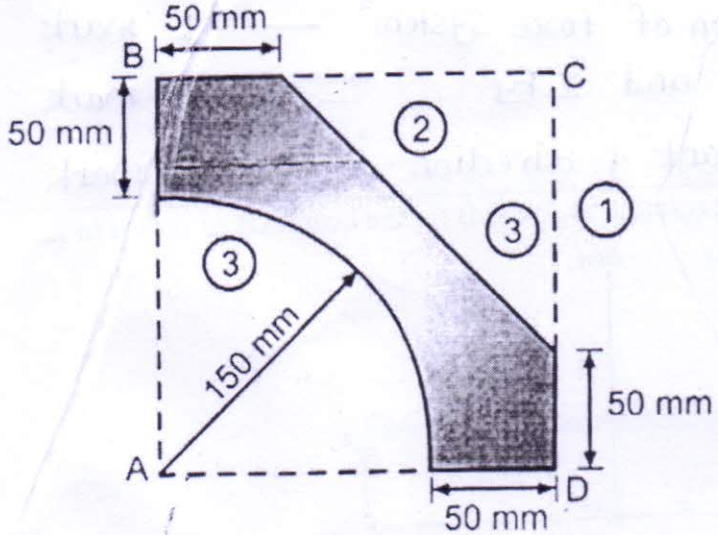


- Area calculation — 4 mark.
- $\bar{X}$ and $\bar{Y}$ — 4 mark

Q.3 [16]

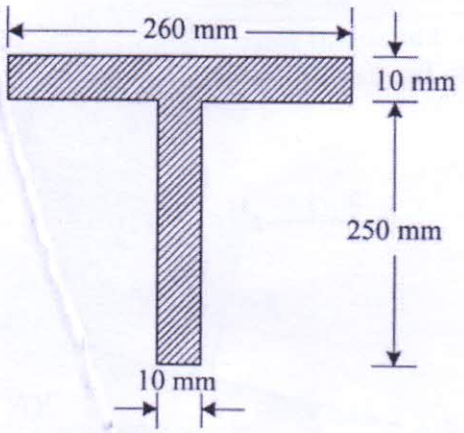
OR

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



- Area calculation & $\bar{x}$ & $\bar{y}$ — 4 mark
- $\bar{X}$ & $\bar{Y}$ calculations — 4 marks.

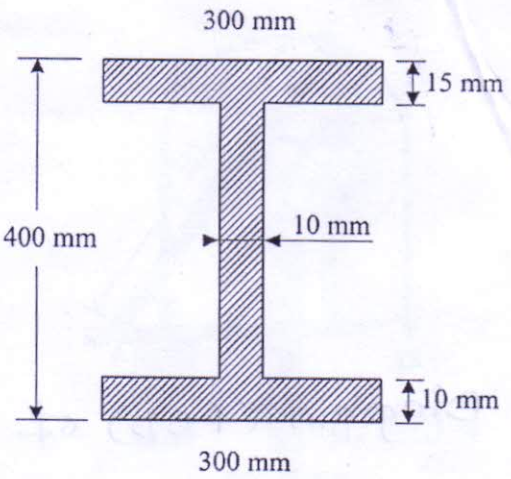
c) Calculate Moment of Inertia for the fig. shown below with respect to X and Y axis (8)

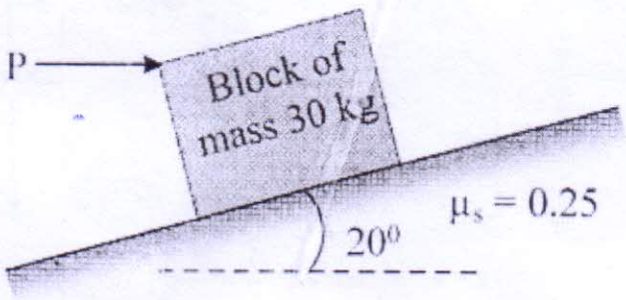
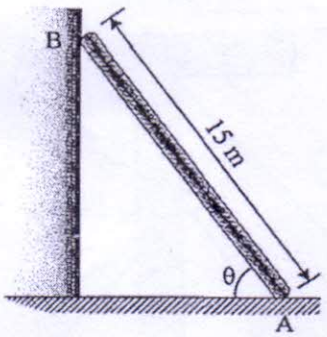


- centroid calculations — 2 Marks
- MOI about $\bar{X}$-axis — 3 Marks
- MOI about $\bar{Y}$-axis — 3 Masks.

OR

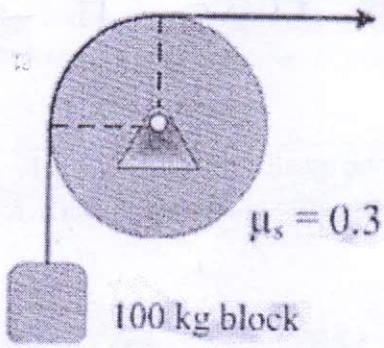
d) Calculate Moment of Inertia for the fig. shown below with respect to X axis shown in fig. All dimensions are in mm.



	• Centroid calculations — 2 Marks. • MOI about $\bar{X}$-axis — 3 Marks • MOI about $\bar{Y}$-axis — 3 marks.	
Q.4	a) Determine the horizontal force P needed to just start moving the 30 kg block up the plane as shown in fig. Take $\mu_s = 0.25$  • FBD of Block — 2 Marks. • Equilibrium Equations — 3 marks. • Calculate Horizontal force (P) — 3 marks. **OR** b) The 15 m ladder has a uniform weight of 80 N and rest against the smooth wall at B shown in Fig. If the coefficient of statics friction at A is $\mu_A = 0.4$. Determine the smallest angle at which the ladder will not slip.  • Free Body Diagram (FBD) of Ladder :— — 2 Marks.	[16]

- Equilibrium Equations — 3 marks.
- calcalation smallest angle (θ) — 3 marks.

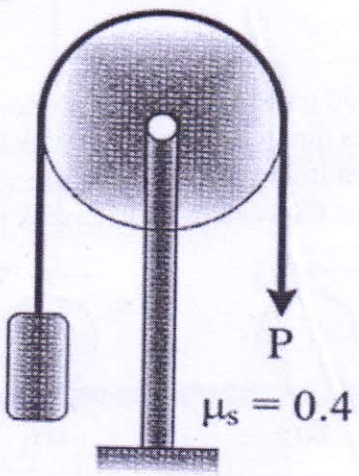
c) A flexible cable which supports the 100 kg block is passed over a fixed circular drum shown in Fig. subjected to a force P to maintain equilibrium. If the coefficient of friction between the cable and drum is $\mu_s = 0.3$, determine the range of P.



- Free Body Diagram (FBD) of Block — 2 marks.
- Calculations of Belt friction formula — 3 mark
- Calculate φ' — 3 marks.

OR

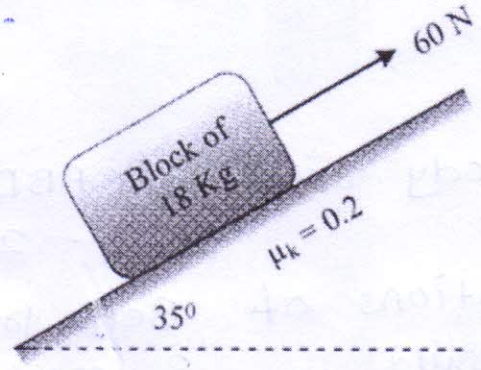
d) A cable is passing over the disc of belt friction apparatus at a lap angle 180^0 as shown in fig. If coefficient of statics friction is 0.4 and the weight of the block is 500 N, determine the range of force P to maintain equilibrium.



- Free Body Diagram (FBD) - Block ——— 2 marks.
- Belt friction formula ——— 3 marks.
- Determine force 'P' ——— 3 marks.

Q.5 [16]

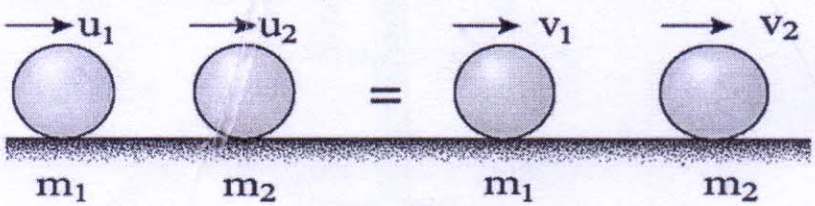
a) Determine the work done by all forces acting on the block of 18 kg as shown in Fig. as it moves 12 m upwards along the plane. Take coefficient of kinetic friction $\mu_k = 0.2$.



- Free Body Diagram — 2 marks.
- Equilibrium Equations — 3 marks.
- Work done (W) ——— 3 marks.

OR

b) Disk A has a mass of 250 g and is sliding on a smooth horizontal surface with an initial velocity of 2 m/s. It makes direct collision with disk B, which has a mass of 175 g and is originally at rest as shown in Fig If both disks are of the same size and the collision is perfectly elastic, determine the velocity of each disk just after collision.



- Free Body diagram & collision — 4 marks.
- Velocity of Disk after collision — 4 marks.

c) A ball has a mass of 30 kg and is thrown upward with a speed of 15 m/s. Determine the time to attain maximum height using impulse momentum principle. Also find the maximum height (8)

- Time to attain max. height — 4 marks.
- Maximum Height (H_{max}) — 4 marks.

OR

d) define following terms with neat sketch

1) Central impact
2) Direct impact
3) Oblique impact
4) Eccentric impact
5) Direct Central impact

- Definition — 1 marks
- sketch — 1 marks.