



(Pages : 3)

**D – 5368**

Reg. No. : .....

Name : .....

**Combined First and Second Semester B.Tech Degree  
Examination, March 2018  
(2008 Scheme)  
08-105 : ENGINEERING MECHANICS (CMNPHERUFBS)**

Time : 3 Hours

Max. Marks : 100

PART – A

Answer **all** questions. **Each** carries **5** marks.

1. Draw the free body diagram of a cylinder of weight 'W' and is resting in a right angled groove whose sides are inclined at an angle  $30^\circ$  and  $60^\circ$  to the horizontal.
2. Explain the different types of loading and explain the term support reactions.
3. Explain the difference between angle of friction and coefficient of friction.
4. Prove that the moment of inertia of any plane figure about a line passing through its centroid is zero.
5. Explain and state D'Alemberts principle and Dynamic Equilibrium.
6. Explain the motion of a lift.
7. State and derive super elevation.
8. Define the natural frequency of angular free vibration.

P.T.O.

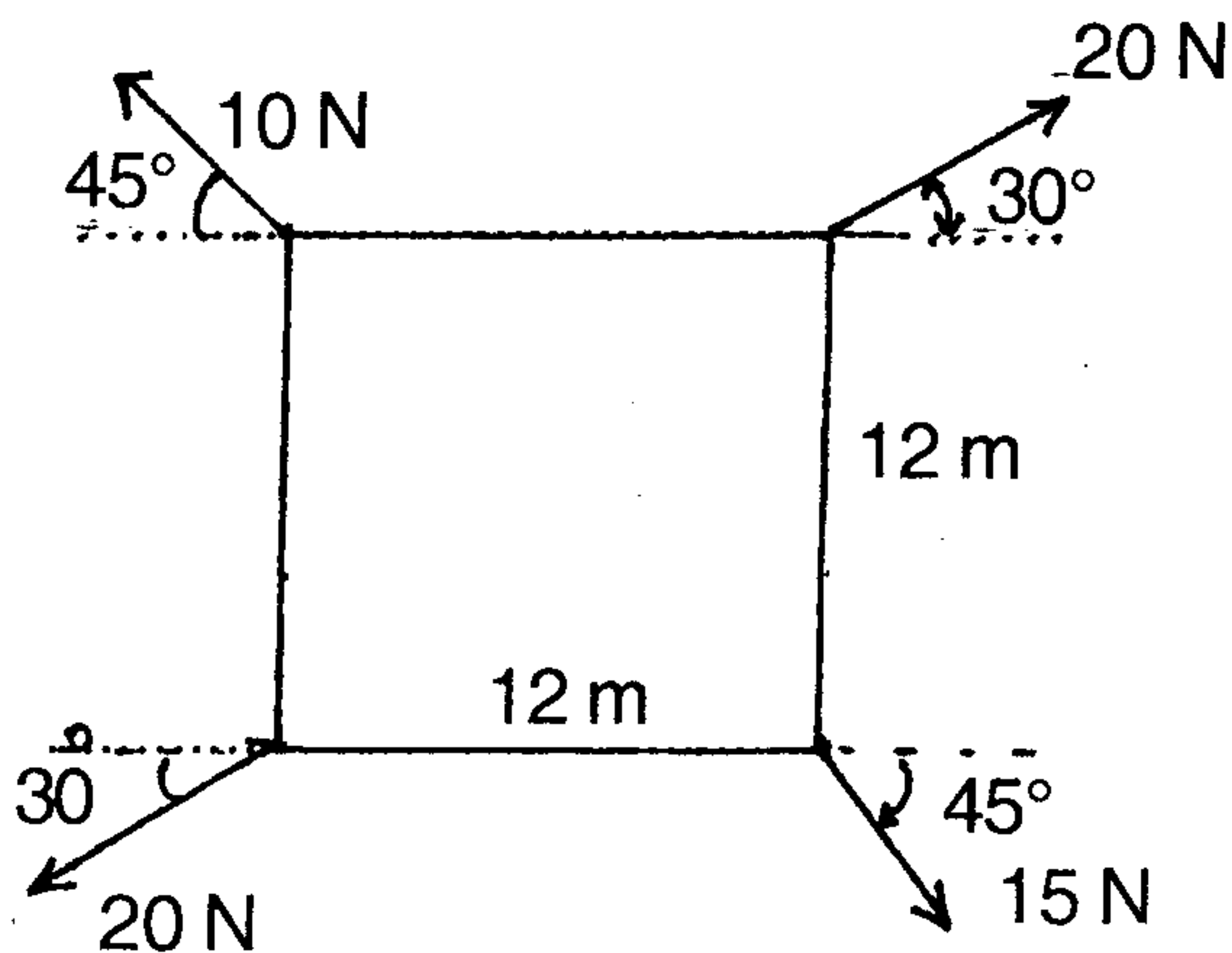


PART – B

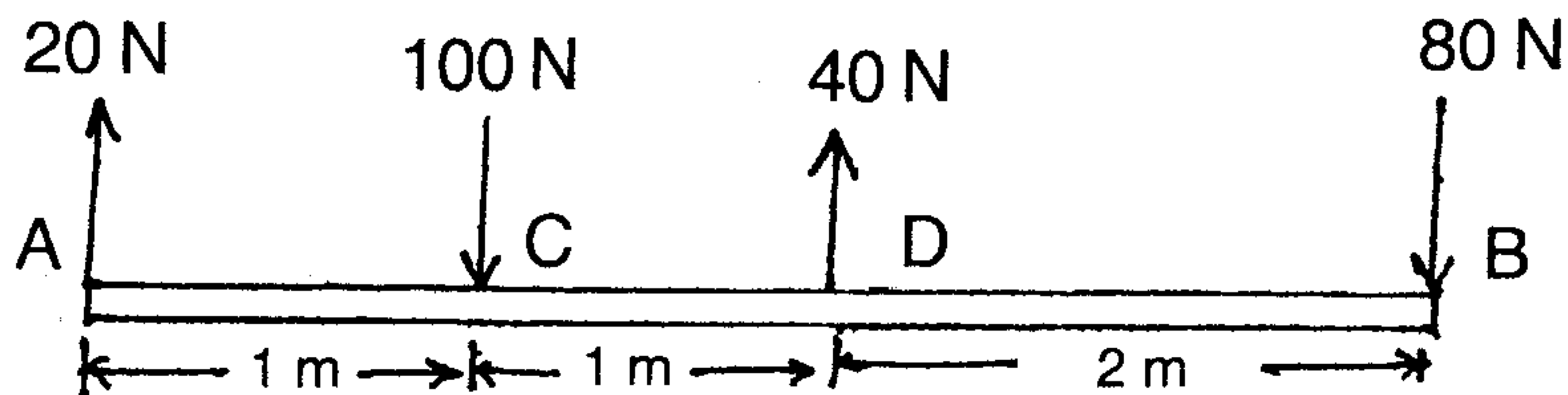
Answer **any two** questions from **each** Module of Part – B. **Each** question carries **10** marks.

Module – I

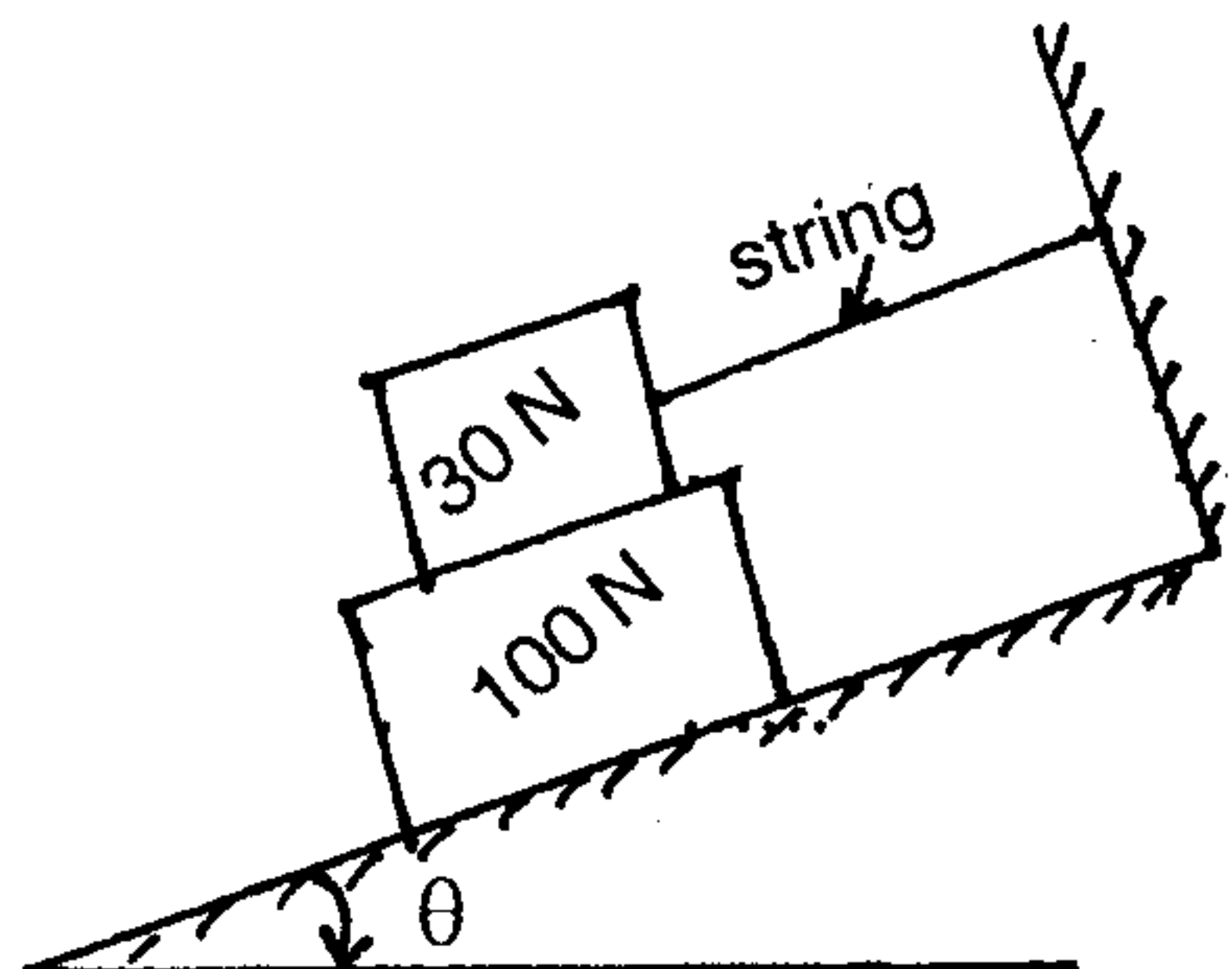
- The figure shows a body under the action of coplanar forces. Determine the magnitude, direction and position of a single force which will keep the body in equilibrium.



- A system of parallel forces are acting on a rigid bar as shown in figure. Reduce this system into 1) a single force 2) a single force and a couple at A 3) a single force and a couple at B.



- Find the value of the angle ' $\theta$ ' and tension in the string so that the motion of the 100 N block just move down the plane. Coefficient of friction for all surfaces is 0.33.





**Module – II**

1. Determine the polar moment of inertia of I section whose dimensions are Top flange  $80 \times 12$  mm, Bottom flange  $120 \times 10$  mm and web  $12 \times 128$  mm.
2. A ship sailing east with velocity 15 km/hr passes a certain point at 12 : 00 noon and a second ship sailing north with the same velocity passes the same point at 1 : 30 pm. At what time are they being maximum close to each other and what is that minimum distance between them ?
3. Two bodies placed 10 m apart are held stationary on inclined plane inclined  $20^\circ$  with horizontal. Coefficient of friction between the plane and lower body is 0.09 and that between the plane and upper body is 0.06. If both the bodies are set in motion at the same instant, calculate the distance through each body travels before they meet together.

**Module – III**

1. Three perfectly elastic balls A, B and C of masses 2 kg, 4 kg and 8 kg move in the same direction with velocities of 4 m/s, 1 m/s and 0.75 m/s respectively. If the ball A strikes with the ball B, which in turn strikes with the ball C, prove that the balls A and B will be brought to rest by the impacts.
  2. Two wheel rims A and B weighing 120 N and 200 N respectively are allowed to roll down an inclined plane, (inclined at an angle  $30^\circ$  with horizontal) from rest. The rim A follows the rim B and the rim when they are just allowed to roll are 2 m between centres. The external radii of the rims A and B are 200 mm and 150 mm respectively. Their radius of gyration are 80 mm and 130 mm respectively. Assuming rolling without slipping. Find the relative acceleration of A with respect to B parallel to the plane.
  3. A body performing simple harmonic motion has a velocity 10 m/s when the displacement is 50 mm and 3 m/s when the displacement is 100 mm, the displacement being measured from the mid point. Calculate the frequency and amplitude of the motion. What is the acceleration when the displacement is 75 mm ?
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