**Code No: CE1501** **R14**

# I B. Tech I Semester Supplementary Examinations, May 2015

## ENGINEERING MECHANICS

**(Common to Civil Engineering & Mechanical Engineering)**

**Time: 3 Hours** **Max. Marks: 60**

**Note:** All Questions from Part A are to be answered at one place.
Answer any Four Questions from Part B

## PART-A

**6 × 2 = 12M**

1. State and explain the conditions of Equilibrium.
2. Define (i) coefficient of friction (ii) angle of friction.
3. Explain about Perpendicular Axis theorem.
4. State the Principle of virtual work.
5. State Newton's laws of motion.
6. State the law of conservation of momentum and its use.

## PART-B

**4 × 12 = 48M**

1. a) A force of 5kN is acting along a line y=15x+20, where x and y are measured in cm. determine the moment of this force about the origin. (6M)

   b) A string ACB of length 120 cm is tied to two points A and B at the same level (Fig.1). A smooth ring of weight 350N, capable of freely suspending along the string is at C, 75 cm from A and is pulled by a horizontal force P. If the point C is 37cm below the level of AB and tensile force in AB is 300N, determine the magnitude of P. (6M)

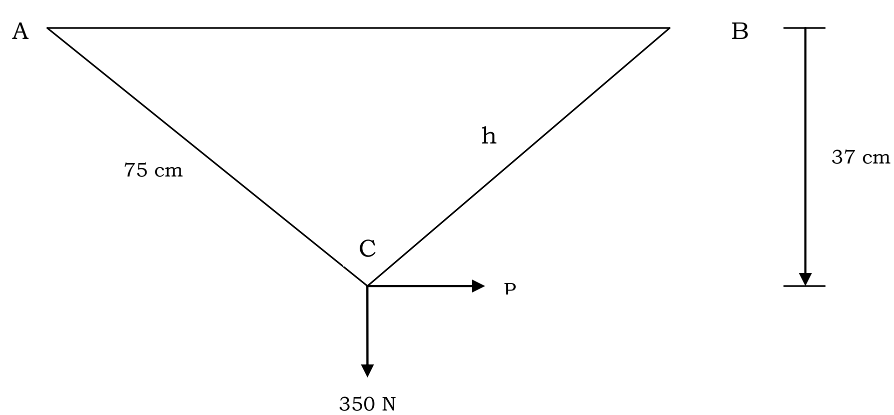


Fig.1

2. a) What is limiting friction? State the Laws of friction. (6M)

   b) A uniform ladder of weight 800N and of length 7m rests on a horizontal ground and leans against a smooth vertical wall. the angle made by the ladder with horizontal is $60^\circ$. When a man of weight 600N stands on the ladder at a distance of 4m from the top of the ladder, the ladder is at the point of sliding. Find the coefficient of friction between the ladder and the floor. (6M)

3. a) Determine from fundamentals, the position of centroid of a sector making an angle $\theta$ at the centre with its central radius in horizontal position. (6M)

   b) Determine the moments of inertial about the horizontal and vertical centroidal axes of an unsymmetrical I section with top flange 300mm × 20mm, web 360mm × 10mm and bottom flange 100mm × 30mm. (6M)

4. a) Derive the expression for the mass moment of inertia of a homogeneous right circular cone of mass M, base radius r and altitude h with respect to its centroidal axes. (6M)

   b) By the principle of virtual work, determine the reactions at the supports A and B for the beam shown in Fig.2. (6M)

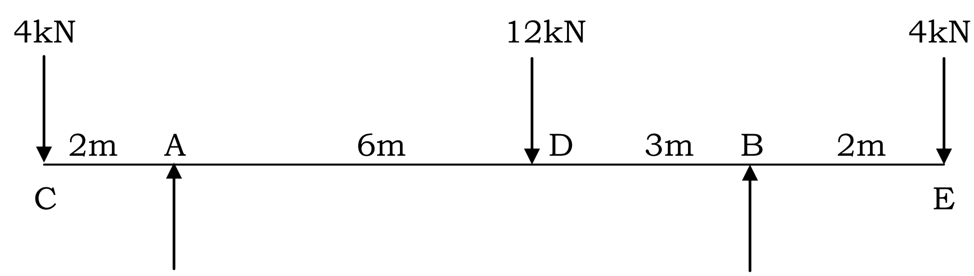


Fig. 2

5. a) If a stone falls past a window of 2.45m height in half a second, find the height from which the stone fell. (6M)

   b) An elevator has a downward acceleration of $1 m/s^2$. What pressure will be transmitted to the floor of the elevator by a man weighing 500N going in the lift? Find the pressure if the elevator had an upward acceleration of $1 m/s^2$. (6M)

6. a) A train, starting from rest, is uniformly accelerated during the first 250m of its run and runs next 800m at uniform speed. It is then brought to rest in 60 seconds under uniform retardation. If the time taken for the entire journey is 6 minutes, find the acceleration with which the train started. (6M)

   b) Three balls of mass 2kg, 6kg and 12kg are moving in the same direction with velocities 12m/s, 4m/s and 2m/s respectively. If the 2kg ball impinges with that of 6kg ball, prove that the first two balls will be brought to rest by the impacts. Assume that the balls are perfectly spherical and elastic. (6M)

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