

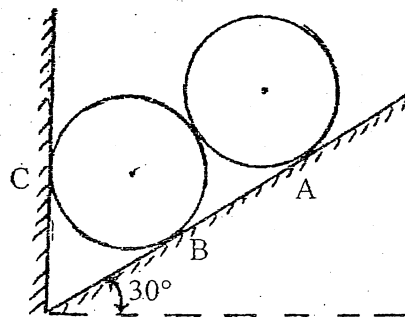
2068 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE, B.Agri, B.Arch	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

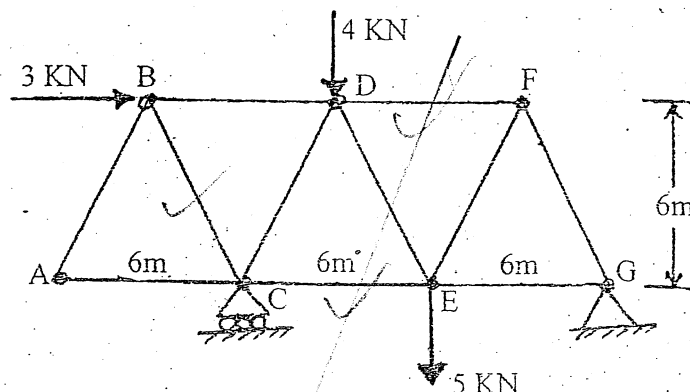
**Subject:** - Applied Mechanics (CE401)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

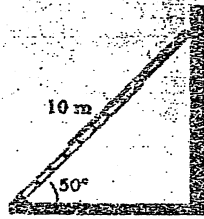
1. What are the fundamental principles of mechanics? Explain briefly. [3]
2. Two identical rollers each of weight  $W = 500\text{N}$  are supported by an inclined plane and a vertical wall as shown figure below. Draw the free body diagram of each roller separately. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C. [8]



3. Use the method of sections to compute the force in bars BC, DF and CE of the Warren truss loaded as shown in figure below. [8]

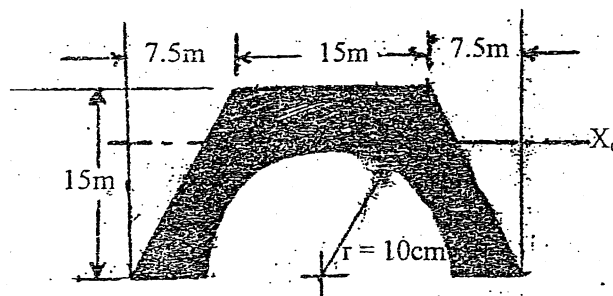


4. A 10m ladder is leaning against a smooth vertical wall and the floor with the friction coefficient 0.4. Determine the normal reactions and the friction force at the top and bottom of the ladder. [4]



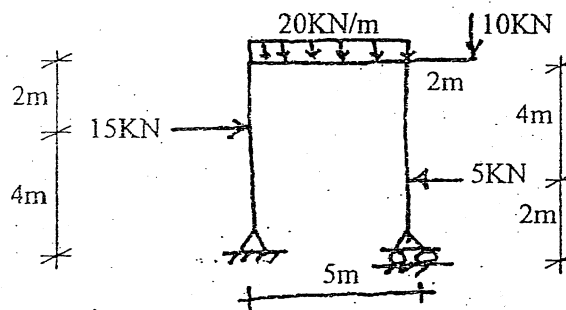
5. Determine the moment of inertia of the shaded area shown in figure below about its centroidal  $X_0$  axis.

[12]



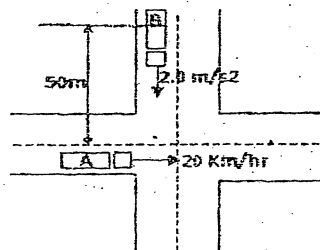
6. What are statically determinate and indeterminate structures? Draw axial force, shear and bending moment diagrams of the frame loaded as shown in figure below.

[3+10]



7. Define the uniformly rectilinear and uniformly accelerated rectilinear motion. Automobile 'A' is travelling east at the constant speed of 20 Km/hr. As automobile 'A' crosses the intersection shown, automobile 'B' starts rest 35m North of a intersection and moves South with a constant acceleration of  $2\text{m/s}^2$ . Determine the position, velocity and acceleration of 'B' relative to 'A'; 10 sec after 'A' crosses the intersection.

[2+8]



8. A particle projected at an angle of  $20^\circ$  with the horizontal axis with an initial velocity of 50m/sec. hits the target located at 'h' meter below the horizontal axis having the inclined

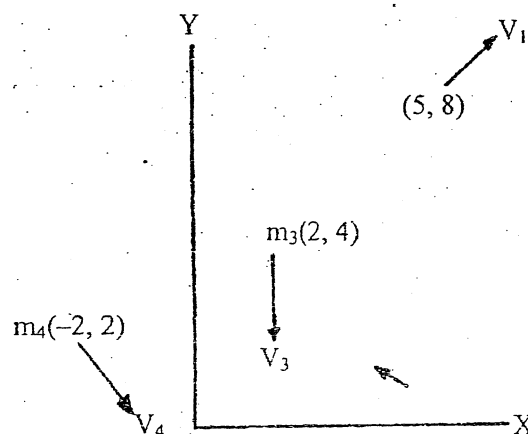
slope of  $\frac{3}{4}$  downward from the axis of the target. Determine the sloping distance covered by the projectile and the maximum height achieved by the projectile from the target. [12]

OR

In Figure below is shown a system of particles at time  $t$  moving in the  $xy$  plane. The following data apply:

$$\begin{aligned} m_1 &= 0.5 \text{ kg} & V_1 &= 1.5i + 1.5j \text{ m/s} \\ m_2 &= 0.35 \text{ kg} & V_2 &= -1.3i + 1j \\ m_3 &= 1 \text{ kg} & V_3 &= -1.3i \\ m_4 &= 0.75 \text{ kg} & V_4 &= 1i - 1.3j \end{aligned}$$

- What is the total linear momentum of the system?
- What is the linear momentum of the center of mass?
- What is the total moment of momentum of the system about the origin and about point  $(2, 6)$ ? [4+4+4]



- Define moment and couple. Determine magnitude direction and position of the resultant force of the forces acting on a rectangular plate shown in figure below. [2+8]

