

Code: CE2T4

I B.Tech - II Semester – Regular Examinations – April 2016

**ENGINEERING MECHANICS
(CIVIL ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1.

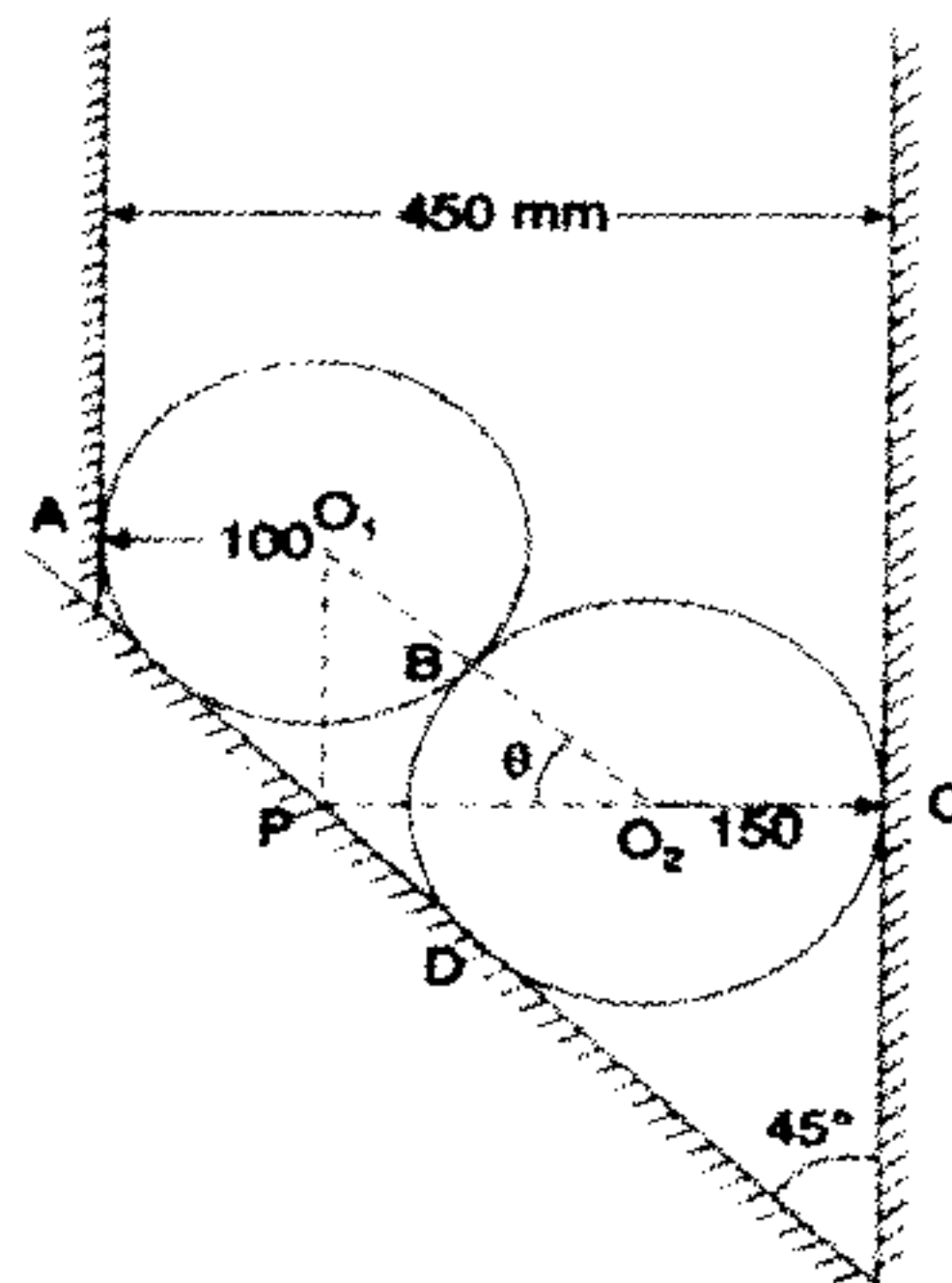
- a) What is a rigid body?
- b) What are the characteristics of a force?
- c) What is the difference between angle of friction and angle of repose?
- d) State Perpendicular axis theorem.
- e) Write the difference between centroid and centre of gravity.
- f) State Pappus first theorem
- g) What is called as a translation motion?
- h) What are the three methods by which the kinetic problem of a body with plane motion could be analyzed?
- i) A particle is projected vertically upwards from the ground with an initial velocity of u m/s. Find the maximum height reached.
- j) State D'Alembert's principle.
- k) How do you define "work done by a force"?

PART – B

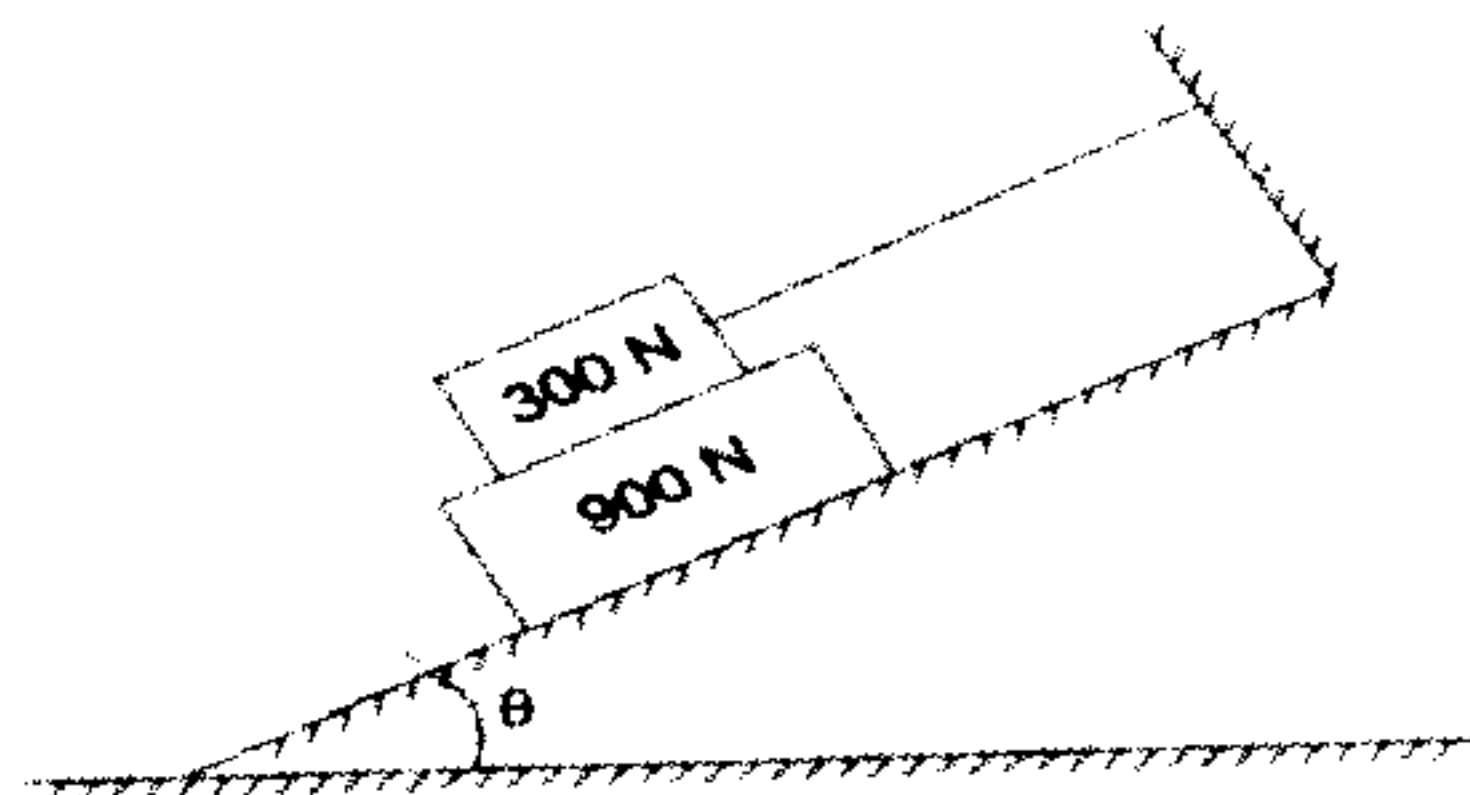
Answer any **THREE** questions. All questions carry equal marks.

$$3 \times 16 = 48 \text{ M}$$

2. a) Cylinder 1 of diameter 200 mm and cylinder 2 of diameter 300 mm are placed in a trough as shown in below figure. If cylinder 1 weighs 800 N and cylinder 2 weighs 1200 N, determine the reactions developed at contact surfaces A, B, C and D. Assume all contact surfaces are smooth. 8 M



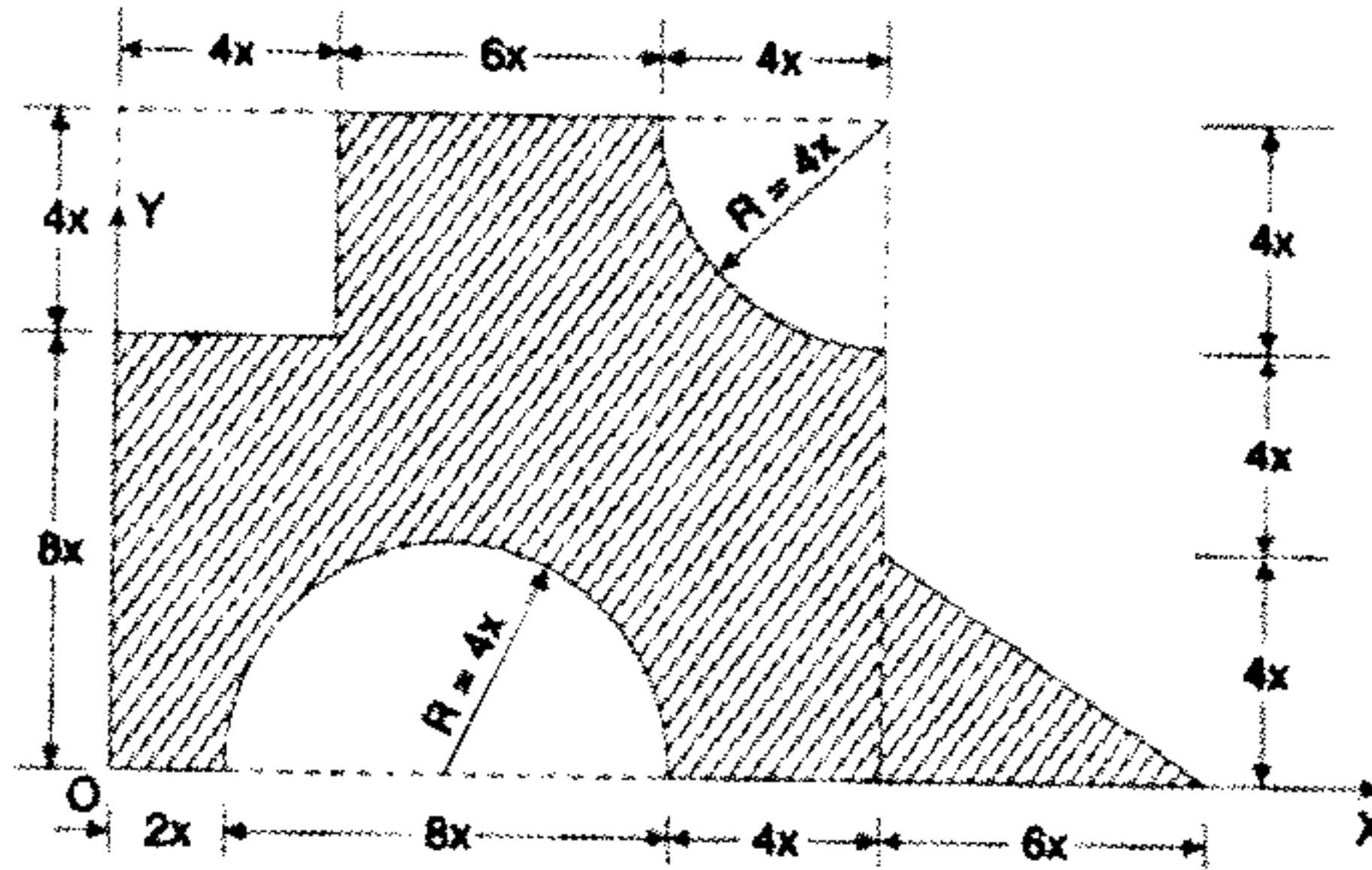
- b) What should be the value of θ in below figure that will make the motion of 900 N block down the plane to impend? The coefficient of friction for all the contact surfaces is $1/3$. 8 M



3. a) Determine the coordinates of the centroid of the plane area shown in below figure with reference to the axes shown.

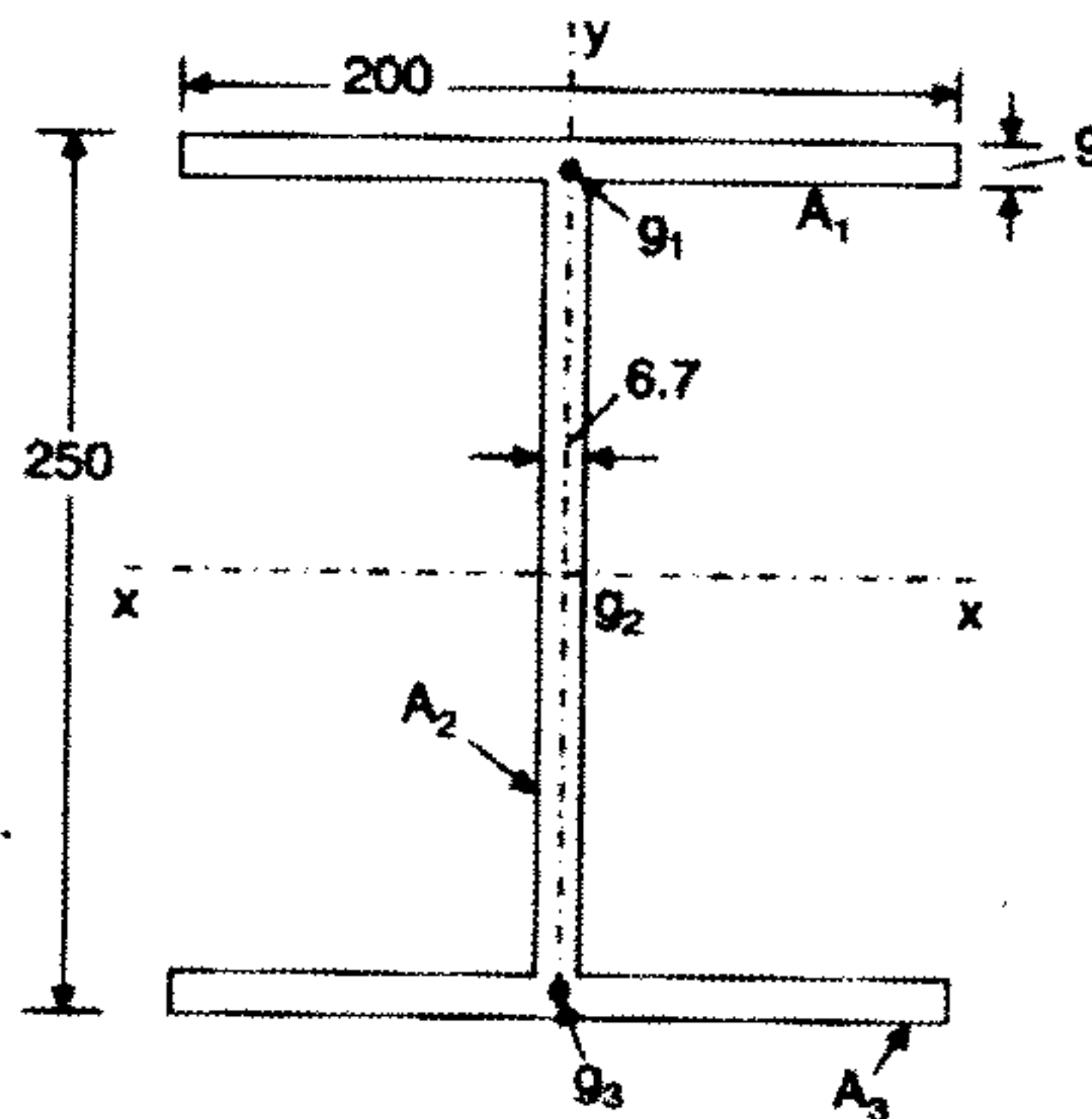
Take $x = 40 \text{ mm}$.

8 M



b) Determine the moment of Inertia of the symmetric I – section shown in below figure about its centroidal axes x-x and y-y. All dimensions are in mm.

8 M



4. a) Find the mass moment of Inertia of a circular plate of radius R and thickness t about its centroidal axis.

8 M

- b) Determine the mass moment of Inertia of a circular ring of uniform cross-section. 8 M
5. a) A man weighing W Newton entered a lift which moves with an acceleration of a m/s^2 . Find the force exerted by the man on the floor when i) lift is moving downward
ii) lift is moving upward. 8 M
- b) A motorist travelling at a speed of 70 kmph suddenly applies brakes and halts after skidding 50 m. Determine the time required to stop the car. 8 M
6. a) The rotation of a flywheel is governed by the equation $\omega = 3t^2 - 2t + 2$ where ω is in radian per second and t is in seconds. After one second from the start, the angular displacement was 4 radians. Determine the angular displacement, angular velocity and angular acceleration of the flywheel when $t = 3$ seconds. 8 M
- b) A flywheel weighing 50 kN and having radius of gyration 1 m loses its speed from 400 rpm to 280 rpm in 2 minutes. Calculate the change in its kinetic energy during the above period. 8 M