Code: **AE1T3, ME1T4**

I B.Tech-I Semester-Regular Examinations-February 2013

ENGINEERING MECHANICS-I

(Common for AE and Mechanical)

Duration: 3hours   Marks: 5x14=70

Answer any FIVE questions.   All questions carry equal marks

1. A rigid bar AB with rollers of weights P = 50 N and Q = 100 N at its ends is supported inside a circular ring in a vertical plane as shown in fig. The radius of the ring and the length AB are such that the radii AC and BC form a right angle at C. that is $\alpha+\beta = 90^0$. Neglecting friction and the weight of the bar AB, find the configuration of equilibrium as defined by the angle $(\alpha-\beta)/2$ that AB makes with the horizontal. Find also the reactions R_a and R_b and the compressive force S in the bar AB.   [14M]
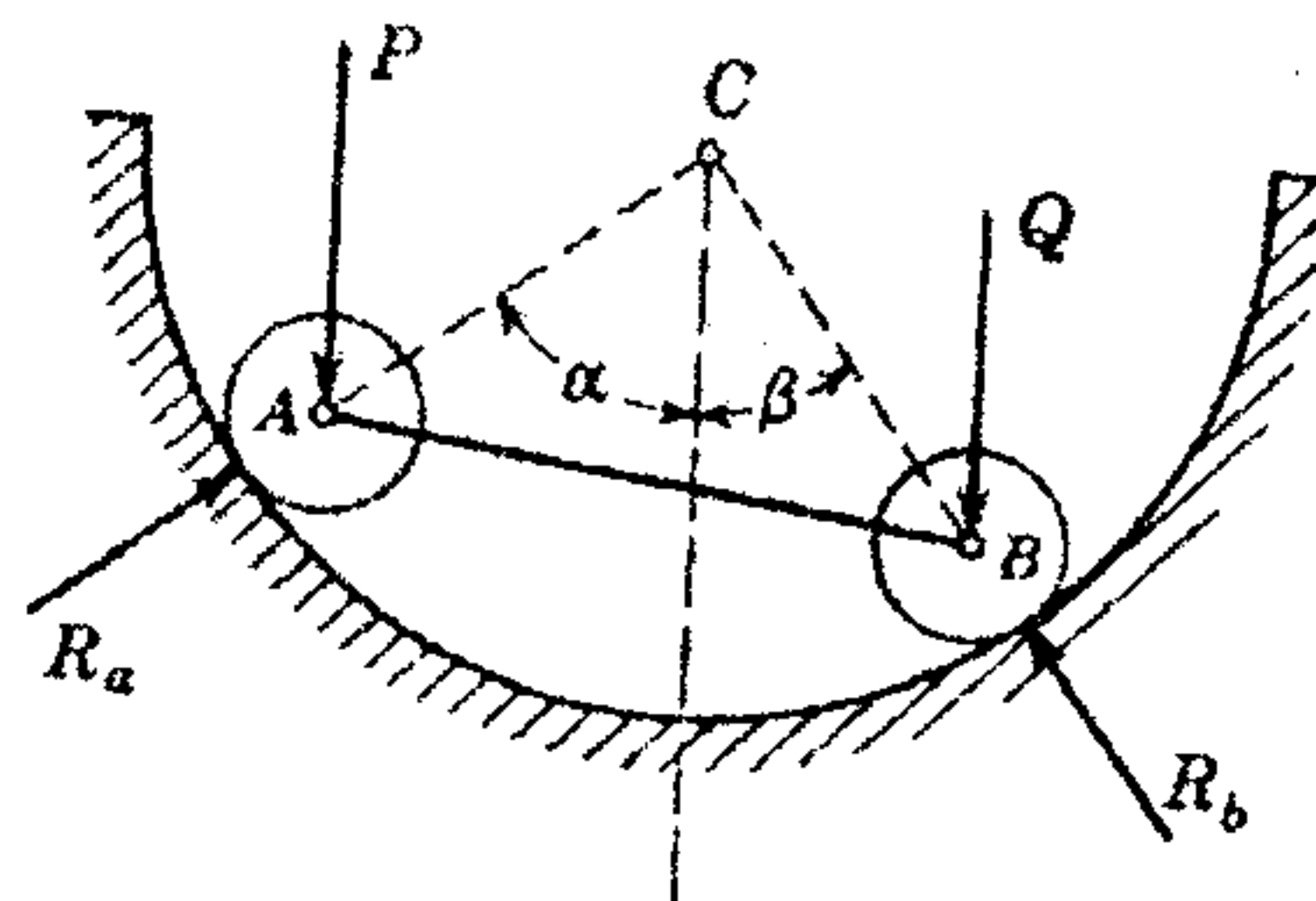
2. a) State Laws of Friction. [7M]

   b) A block of weight 1600 N is in contact with a plane inclined at 30° to the horizontal. A force 'p' parallel to the plane and acting up the plane is applied to the body. The coefficient of friction between the contact surfaces is 0.20. Find. (a) the value of 'p' to just cause the motion to impend up the plane, (b) the value of 'p' to just prevent the motion down the plane, (c) the magnitude and direction of frictional force if p = 900 N. [7M]
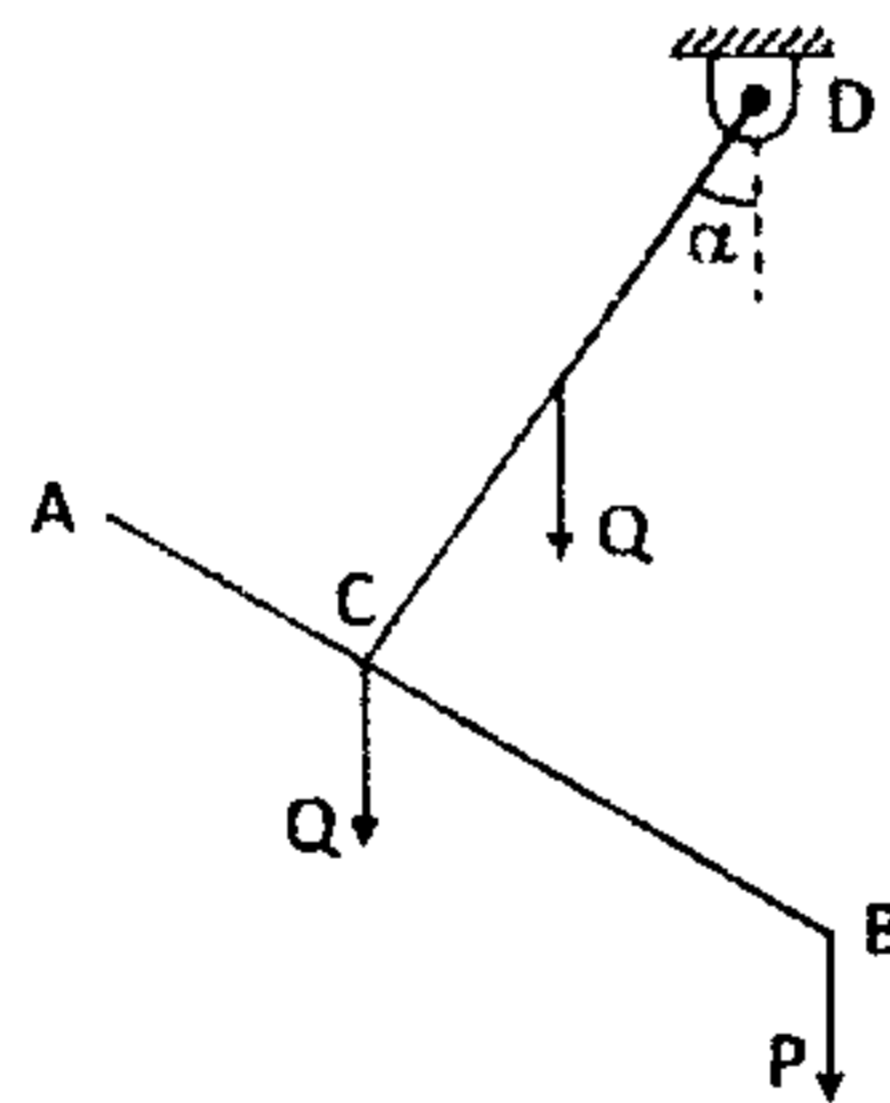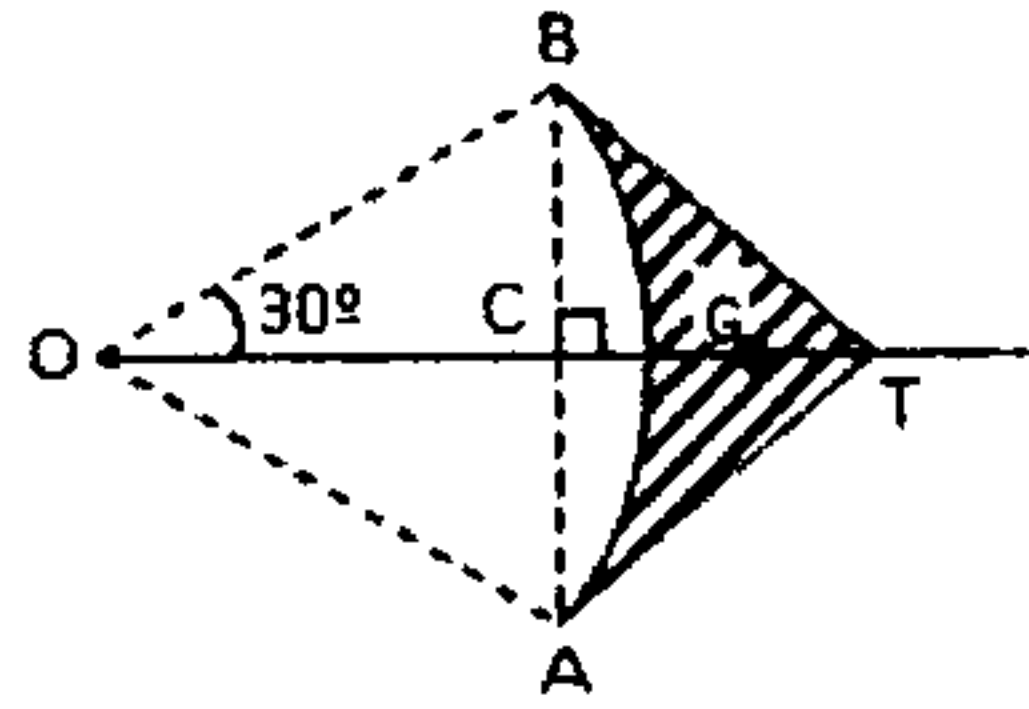
3. a) State properties of couple. [7M]

   b) Determine the angle α to keep the given system in equilibrium if CD, AB are two identical bars Q=5N and P=10N. [7M]
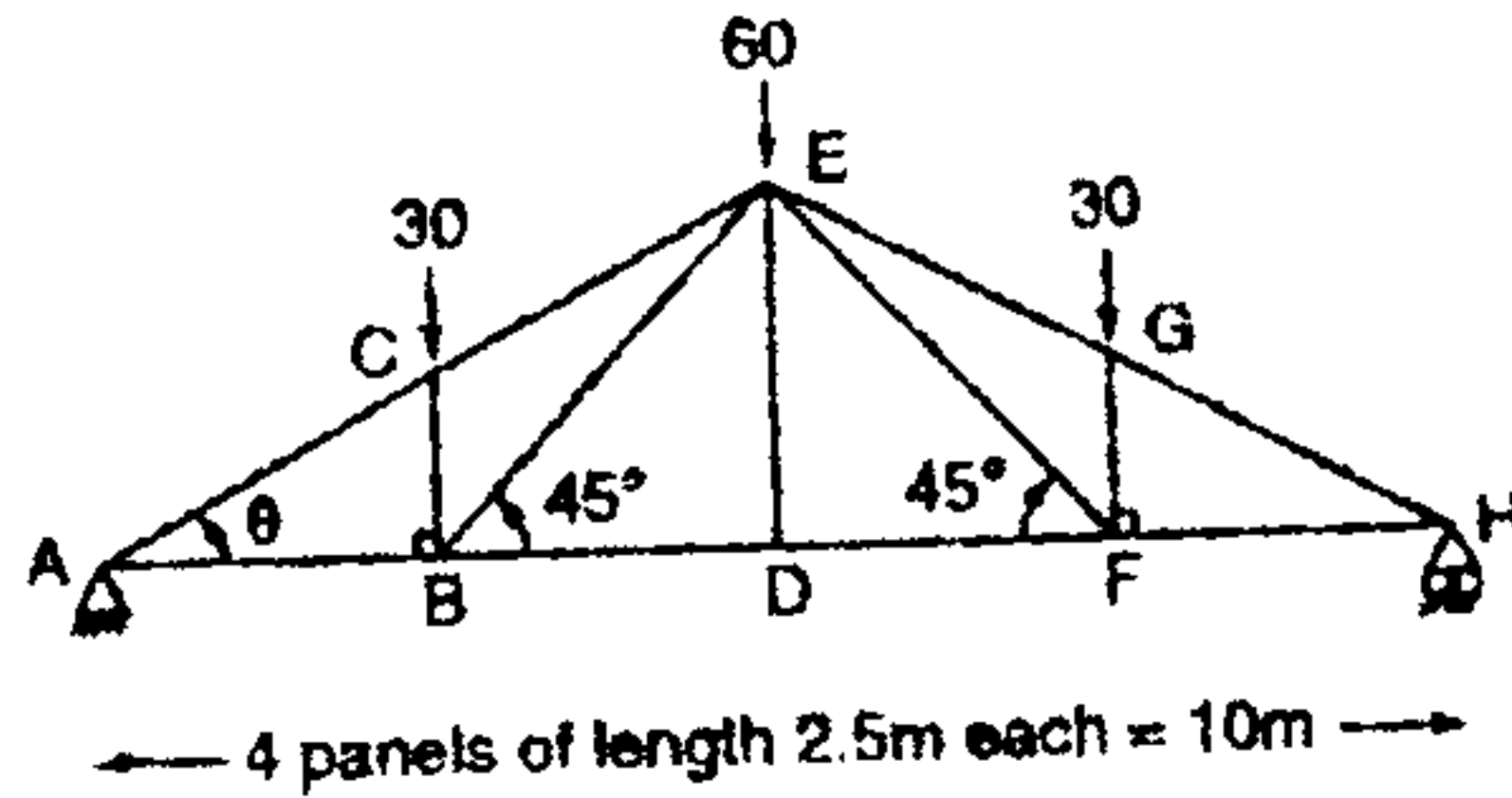

4. Two tangents are drawn to a circular arc of radius 100 mm subtending an angle of 60° at the center. Locate the center of gravity of the area bounded by the tangents and the arc between them. [14M]

5. Find the forces in members for the truss shown in fig using
   method of joints. [14M]

— 4 panels of length 2.5m each = 10m →

6. Two parallel forces F_1 and F_2 of opposite sense
   $F_1 = 50i + 80j + 100k$ and $F_2 = -50i - 80j - 100k$ act at points A
   $(0.7, 1.5, 1.0)$ and B $(1, 0.9, -1)$ respectively. Determine the
   moment of couple and perpendicular distance between line of
   action of the forces. [14M]

7. A uniform ladder 10 m long weighing 400 N rests on a
   smooth floor at A and against a smooth wall at B.
   A horizontal rope PQ prevents the ladder from slipping. Using

the method of virtual work determine the tension in the rope.

[14M]
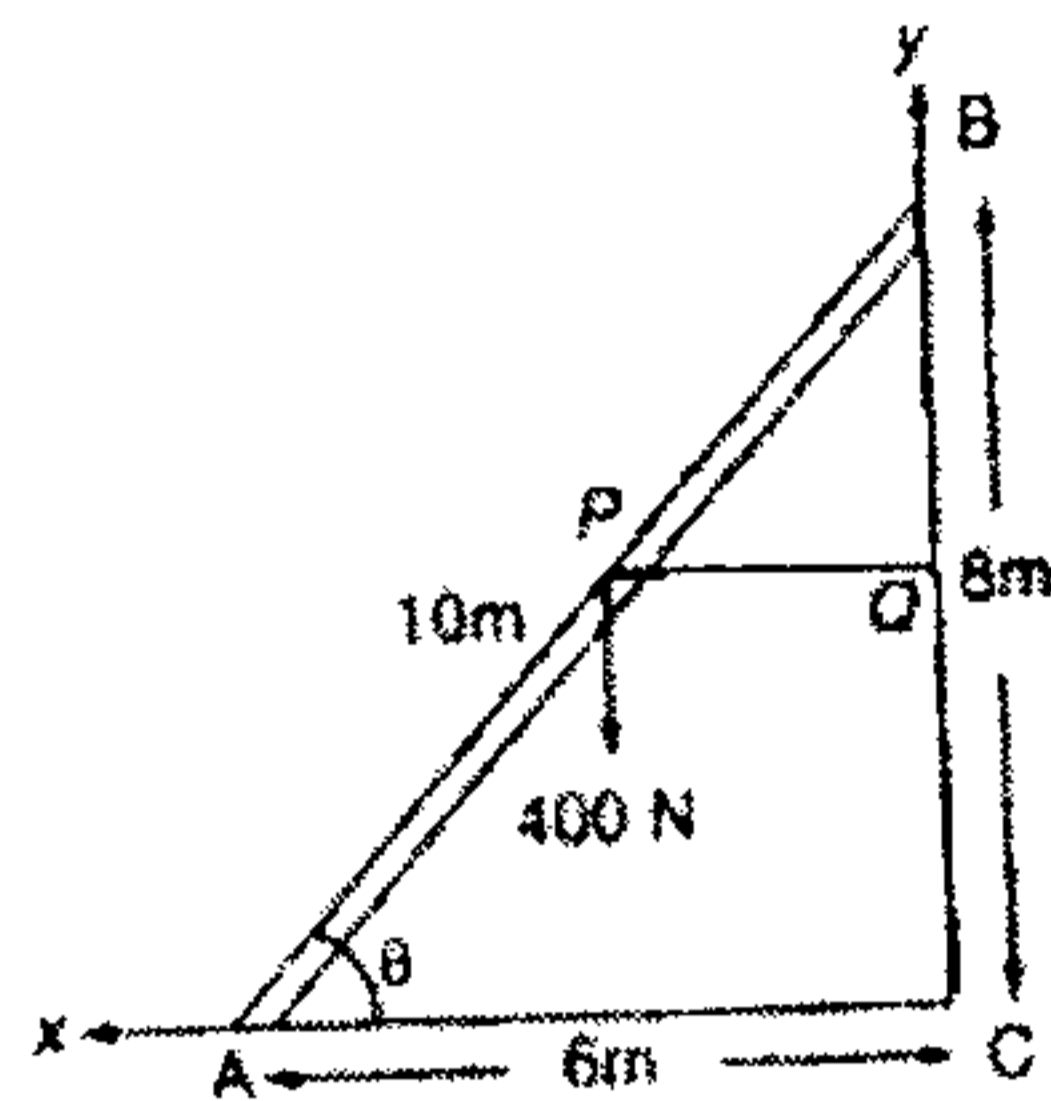
8. Find the moment of inertia of the plane area about its centroidal axis. [14M]
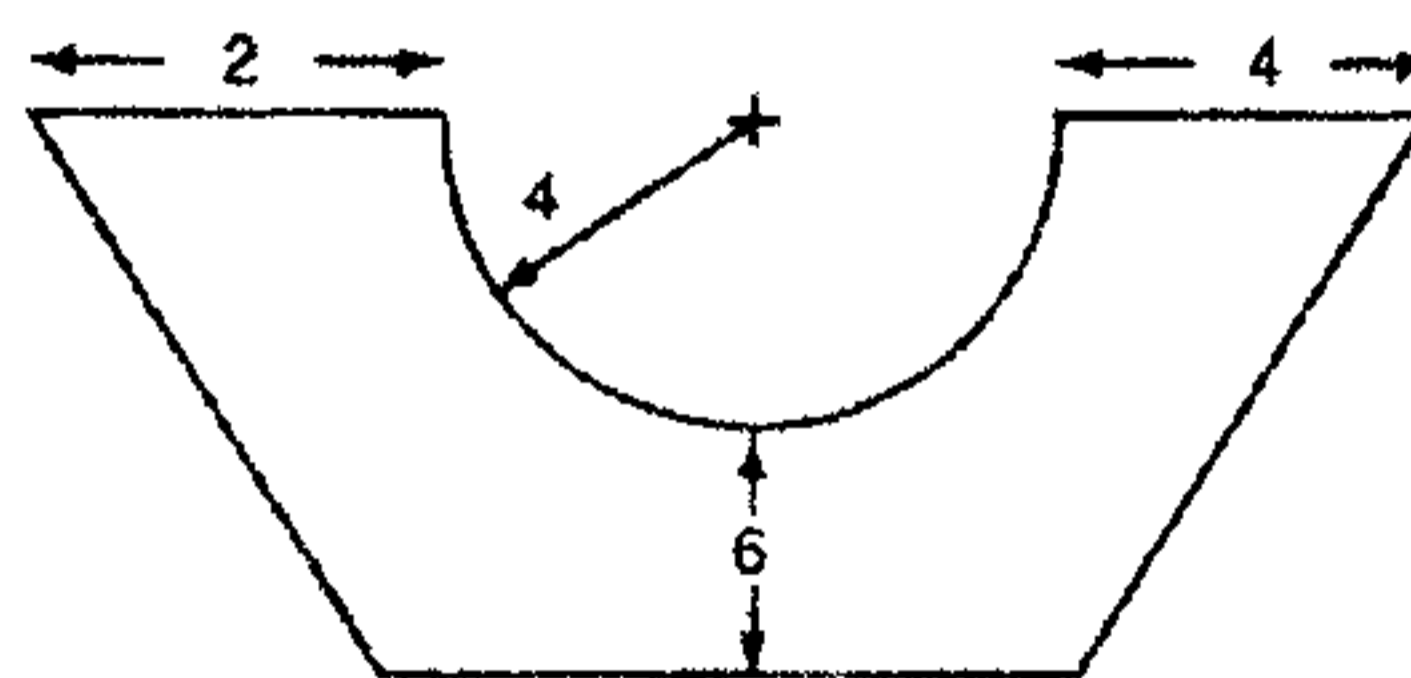
all dimensions are in centimeters.