Code: CE2T4

I B.Tech - II Semester – Regular/Supplementary Examinations – May 2017

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) If two forces are in equilibrium, what is the nature of the forces?
   b) Determine the components of a 20 kN weight along the plane and normal to the inclined plane making an angle 30^0 to the horizontal.
   c) State the laws of friction.
   d) Write the coordinates of the centroid for
      i) semicircle   ii) quadrant of a circle.
   e) State parallel axis theorem and perpendicular axis theorem.
   f) Find the reactions of the simply supported beam of span 6m, loaded with an eccentric load of 10 k N located at 2m from the left end using principle of virtual work.
   g) A stone is dropped into a well and the sound of splash is heard after 4 seconds. Assuming the velocity of sound to be 350 m/s, find the depth of the well.
   h) State and explain D'Alembert's principle for curvilinear motion.

i) What are tangential and normal accelerations?

j) Differentiate kinetics from kinematics.

k) What are the different states of equilibrium?

PART - B

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

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

2. a) A ball of weight W resting on a smooth plane is attached at its centre to two strings which pass over smooth pulleys and carry loads P and Q. Find the angle Θ defining the position of equilibrium and the reaction between the ball and the horizontal surface.   8 M
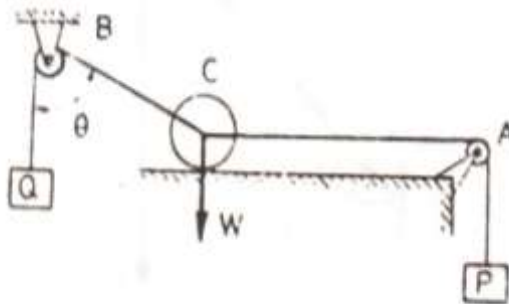

b) Two blocks of weights W_1 and W_2 are connected by a string and rest on a horizontal plane as shown. Find the magnitude and Direction of the least force P that should be applied to the upper block to induce sliding. The coefficient of friction for each block is to be taken as μ.   8 M
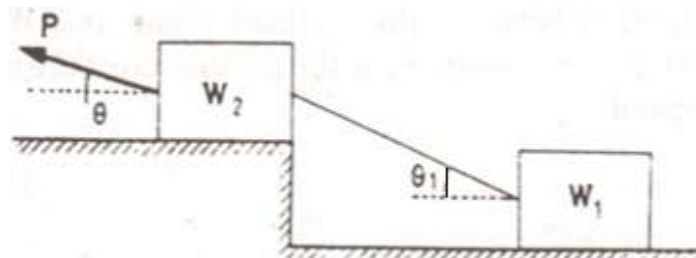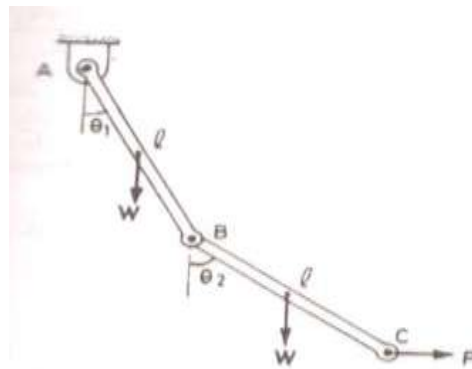
3. a) Determine the centroid coordinates for a triangle from the
    basics.   4 M

   b) Determine the M.I of the given area about the centroidal
      axes parallel to and perpendicular to the axis AB.   12 M
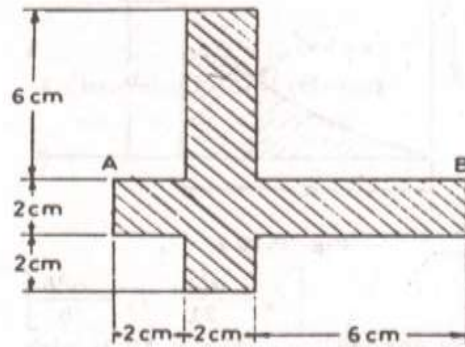
4. Two uniform rods of length l and weight W are connected as
   shown. Using the method of virtual work determine θ_1 and θ_2
   corresponding to equilibrium of bars.   16 M

5. a) Driver of a car travelling at 72 kmph observes the light
      300 m ahead of him turning red. The traffic light is timed to
      remain red for 20 seconds before it turns green. If the
      motorist wishes to pass the lights without stopping to wait
      for it to turn green, determine   8 M
      i) the required uniform acceleration of the car
      ii) the speed with which the motorist crosses the traffic
         light.

b) A Stepped pulley shown in figure starts from rest and accelerates at 2 rad/s².What time is required for block A to move 20m. Find also the velocity of A and B at that time.

8 M
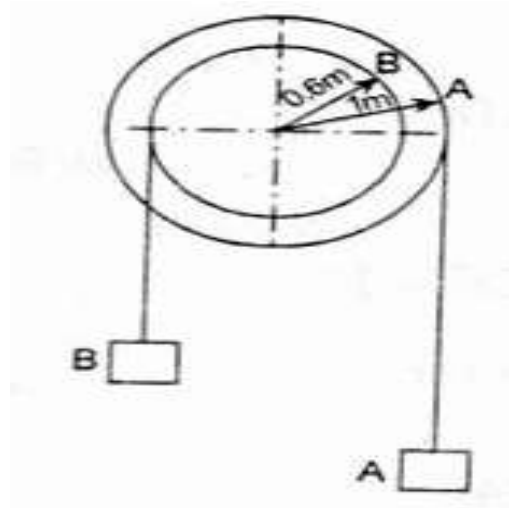
6. An outfielder experiments with two different trajectories for throwing to home plate from the position shown:
(a) $v_0 = 42$ m /s with $\theta = 8°$ and (b) $v_0 = 36$ m /s with $\theta = 12°$. For each set of initial conditions, determine the time 't' required for the baseball to reach home plate and the altitude h as the ball crosses the plate. 16 M