Mid-West University

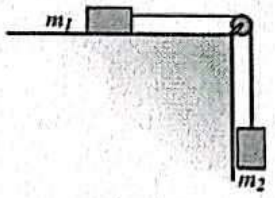
Examinations Management Office

End-Semester Examinations -2080

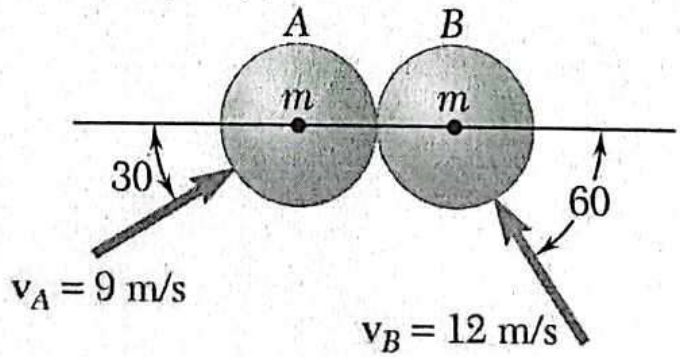
Bachelor level/ B.E. Hydropower/ II Semester — Full Marks: 50
Time: 3 hours — Pass Marks: 25
Subject: Applied Mechanics-II (Dynamics) (HE421/CE103/HE103)

- *Attempt all the questions*
- *Figures in the margin indicate full marks.*
- *Assume suitable values, with a stipulation, if necessary.*
- *Candidates are required to answer the questions in their own words as far as possible.*

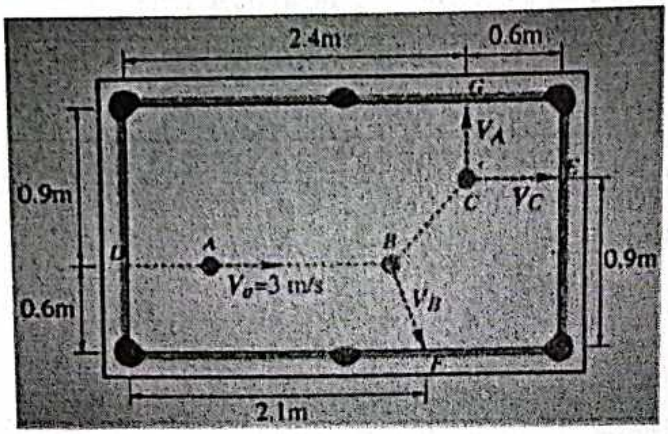
1. Define static and dynamics. Differentiate between kinematics and kinetics. **(2+2)**
2. The position of a particle which moves along a straight line is defined by the relation $x = t^2 - 6t^3 - 15t + 40$, where x is expressed in meter and t in seconds. Determine: **(4)**
   a) The position and distance travelled by the particle at the time.
   b) The acceleration of the particle at the time.
   c) The distance travelled by the particle from 4 sec to 6 sec.
   d) The time at which the velocity will be zero.
3. A car moves with constant tangential acceleration down a ramp. If it starts from rest at A and reaches B after 6 s with a speed of 15 m/s, find the radius of curvature at B if the total acceleration of the car at that point is 5.5 m/s^2. **(5)**
4. Two masses connected by a light string over a frictionless pulley of negligible mass. Find the tension in each string in the system shown in fig. where masses of two bodies are 150 kg and 450 kg respectively. **(5)**



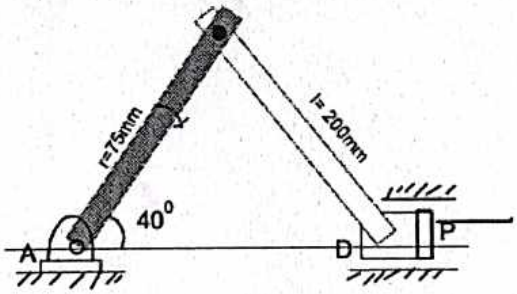
5. The magnitude and direction of the velocities of two identical frictionless balls before they strike each other are as shown. Assuming e = 0.85, Determine the magnitude and direction of the velocity of each ball after the impact. **(6)**



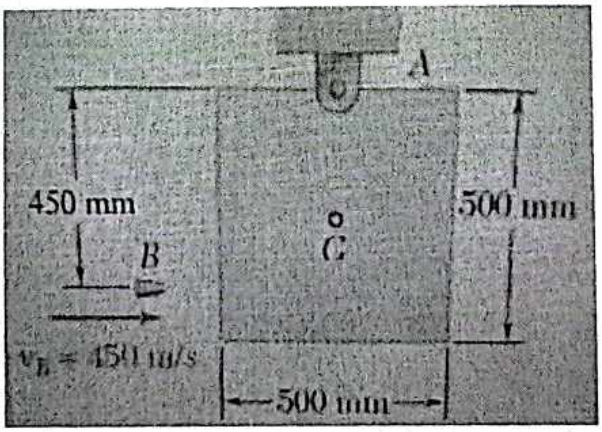
6. In a game of billiards, ball A is given an initial velocity Vo = 3 m/s along line DA parallel to the axis of the table. It hits ball B and then ball C, which are both at rest. Knowing that A and C hit the sides of the table squarely at points G and E respectively, and B hits the side obliquely at F, and assuming frictionless surfaces and perfectly elastic impacts, determine the velocity Vc with which the ball C hits the side of the table at E. **(6)**



7. Describe about translation and rotational motion of rigid bodies. In the engine system shown, the crank AB has a constant clockwise angular velocity of 2000rpm. For the crank position indicated, determine: (a) the angular velocity of the connecting rod BD (b) the velocity of position P. **(2+6)**



8. Explain D'Alembert's principle and prove that the equation of motion for a rigid body. **(4)**
9. Explain Principle of work and energy for a rigid body. **(2)**
10. A 20 gm bullet 'B' is fired with a horizontal velocity of 450 m/s into the side of a 10 kg square panel suspended from a hinge at 'A'. Knowing that the panel is initially at rest, determine: a) The angular velocity of the panel immediately after the bullet becomes embedded. b) The impulsive reaction at 'A' assuming that the bullet becomes embedded in 0.0008 sec. **(6)**



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