

Mid-West University
Examinations Management Office
 End-Semester Examinations -2080

Bachelor level / B.E. Civil / 2nd Semester

Time: 3 hours

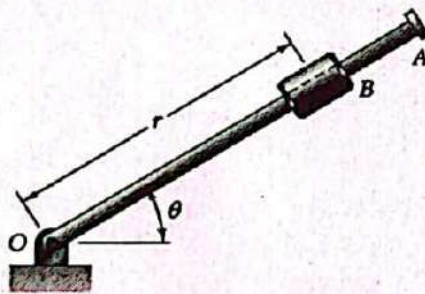
Subject: Applied Mechanics-II (CE421/CE103)

Full Marks: 50

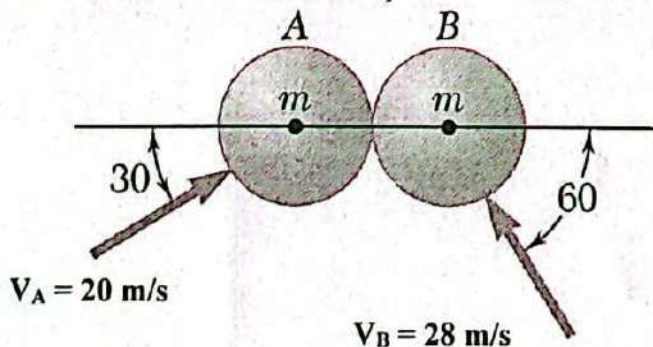
Pass Marks: 25

- 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.

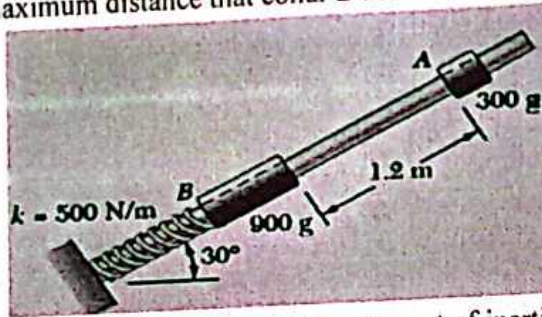
1. a) List out the Scope and significance of Applied Mechanics in Engineering sector, briefly explain. Derive the equation of tangential and normal components of motion. 2+4
- b) Rotation of the arm about O is defined by $q = 0.15t^2$ where q is in radians and t in seconds. Collar B slides along the arm such that $r = 0.9 - 0.12t^2$ where r is in meters. After the arm has rotated through 30° , determine 6
- i. the total velocity of the collar,
 - ii. the total acceleration of the collar, and
 - iii. the relative acceleration of the collar with respect to the arm



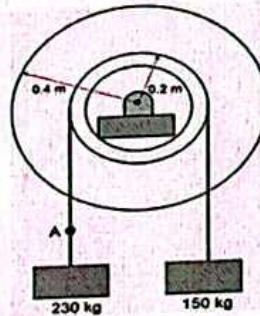
2. a) Starting from $x = 0$ with no initial velocity, a particle is given an acceleration $a = \sqrt{v^2 + 49}$, where a and v are expressed in m/sec^2 and m/sec respectively. Determine; 5
- i. The position of the particle when $V = 24 \text{ m/sec}$.
 - ii. The speed of the particle when $X = 40 \text{ m}$.
- b) The magnitude and direction of the velocities of two identical smooth balls before they strike each other are as shown in figure. Assuming $e = 0.80$, Determine the magnitude and direction of the velocity of each balls after the impact. How much K.E. will be lost due to the impact? 5



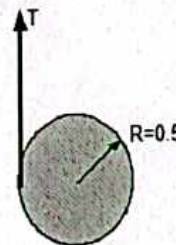
3. a) A 300 g collar A is released from rest slides down a frictionless rod, and strikes a 900 g collar B which is at rest and supported by a spring of constant 500 N/m. Knowing the velocity of collar A is zero immediately after impact,
- Determine the co-efficient of restitution between the two collars,
 - Energy lost during impact,
 - the maximum distance that collar B moves down along the rod after impact



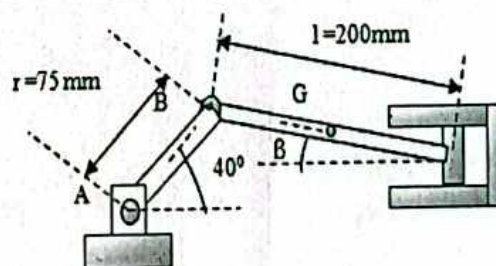
- b) Each of the pulleys shown has a mass moment of inertia of 20 kg m^2 and is initially at rest. The outside radius is 0.4 m and the inner radius is 0.2 m. Determine (a) the angular acceleration of each pulley, (b) the angular velocity of each pulley after point A on the cord has moved 3 m.



4. a) A cord is wrapped around a homogeneous disk of radius $r = 0.5 \text{ m}$ and mass $m = 15 \text{ kg}$. If the cord is pulled upward with a torque T of magnitude 180 N, determine
- The acceleration of the center of the disk
 - Angular acceleration of disk
 - The acceleration of cord.



- b) Explain D'Alembert's principle and prove that rate of change of angular momentum of force acting at the same points.
5. In the engine system shown, the Crank AB has a constant angular velocity of 2500 rpm. For the Crank position indicated, determine;
- The angular velocity of the connecting rod BD.
 - The velocity of the piston P.
 - The angular acceleration of rod BD



The End