AM 110 Engineering Mechanics
QUIZ 2

Date of Exam: 19th October 2007 **Time:8:00-8:50am**

1. This Question paper consists of two sections.
2. Section **A** consists of **FIVE** Multiple Choice Questions, which should be answered on the same sheet and submitted along with your answer script. You should specify the corresponding choice **ONLY** in the **parentheses** given against each question.
3. There are **TWO** questions in Section **B**, which should be answered in the answer script.
4. Make suitable assumptions if required and state them clearly.
5. Answer **All** questions.

SECTION A

FIVE Multiple Choice Questions attached in a separate sheet along with the answer script given.

5x1 = 5 marks

SECTION B

Q(1) A board of length 3m, weighing 200N, is placed across the channel and a boy weighing 400N, attempts to walk across (as shown in **Figure 1**). If the coefficient of static friction at *A* and *B* is μ_S = 0.3. Determine the distance **d**, the boy can travel from *A* before the board slips.

(5 marks)

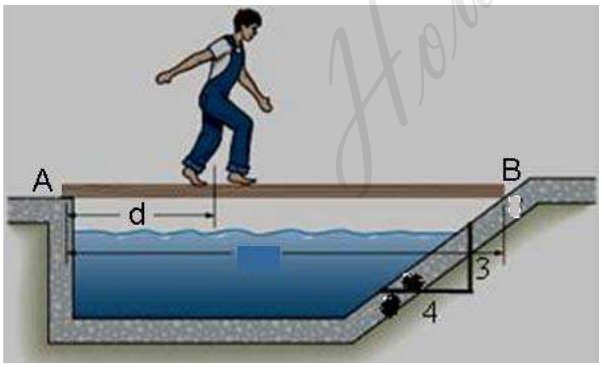

Figure 1

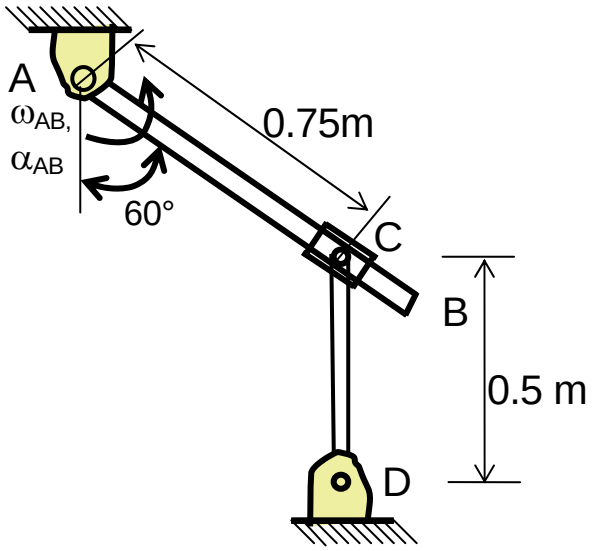

Figure 2

Q(2) At the instant shown in **Figure 2**, rod AB has an angular velocity ω_{AB}=3 rad/s and an angular acceleration α_{AB} = 5 rad/s^2. Determine the angular velocity and angular acceleration of the rod CD at this instant. The collar at C is pin connected to CD and slides over AB. Length of CD is 0.5m.

(5 marks)

THE END

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QUIZ 2 – SECTION A

NAME : **Roll No:**

MCQ: Multiple Choice Questions

Q(1). In the context of Rigid body mechanics, which of the following statement is **False**. **( )**

ANS:
(A) If a particle, moves along a curved path with constant speed, the tangential acceleration is zero.

(B) Instantaneous centre of rotation can be used to determine both velocity and acceleration of a rigid body.

(C) When we perform relative motion analysis using rotating axes, we need to include Coriolis acceleration term.

(D) For a bicycle wheel, which rotates without slipping, the instantaneous centre of rotation is located at the point of contact with the road.

Q (2). The rim of a wheel has the top point at B and is in contact with the floor at C Due to slipping the points at C and B have velocities as V_C = 2 m/sec V_B = 8 m/sec as shown in **Figure.3**. Radius of the wheel is 0.5m. What is the velocity of the point D (which is on the rim of the wheel) at this instant ?

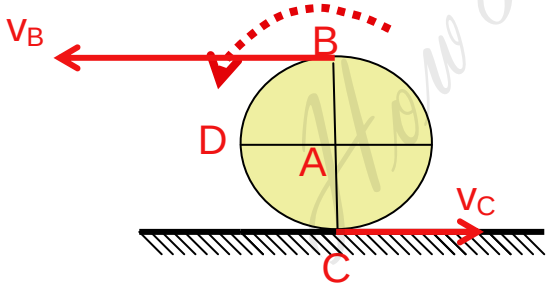

Figure 3

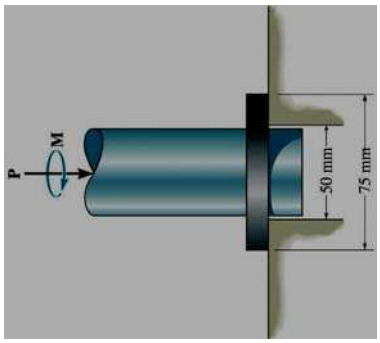

Figure 4

ANS: (A) 3 m/sec (B) 5 m/sec (C) 10 m/sec (D) 5.83 m/sec **( )**

Q (3). The collar bearing uniformly supports an axial force P = 2kN and M = 4 N.m is applied to the shaft as shown in **Figure 4**. Determine the coefficient of kinetic friction (μ_k) at the point of contact.

ANS: (A) 0.3 (B) 0.126 (C) 0.063 (D) 0.0315 **( )**

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QUIZ 2 – SECTION A

Q (4). Given the Lagrangian function for a particular problem as ( )

$L = M\dot{x}^2 + m(\dot{x}^2 + 2\dot{x}x + x^2)$

One of the following represents the correct equation of motion for the Dynamical system.

ANS: **(A)** $\ddot{x} = \dfrac{m}{(m+M)}\dot{x}$

(B) $\ddot{x} = -\dfrac{m}{(m+M)}\dot{x}$

(C) $\ddot{x} = \dfrac{m}{(m+M)}x$

(D) $\ddot{x} = -\dfrac{m}{(m+M)}x$

Q (5). An ant falls into a spherical bowl as shown in **Figure 5.** If the ant tries to crawl out of the bowl, what will be its status. Given the coefficient of static friction between the insect and the bowl is, μ_S= 0.4.

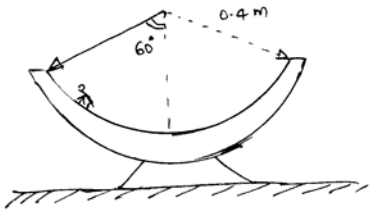

Figure 5

ANS: (A) Insufficient data. Weight of the ant is not given. ( )

(B) Ant can always crawl out of a bowl.

(C) It can not crawl out of the bowl.

(D) Coefficient of static friction is completely irrelevant for ants.

THE END