

AMERICAN UNIVERSITY OF BEIRUT
FACULTY OF ENGINEERING AND ARCHITECTURE
MECH 230 DYNAMICS – QUIZ 2

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NAME:

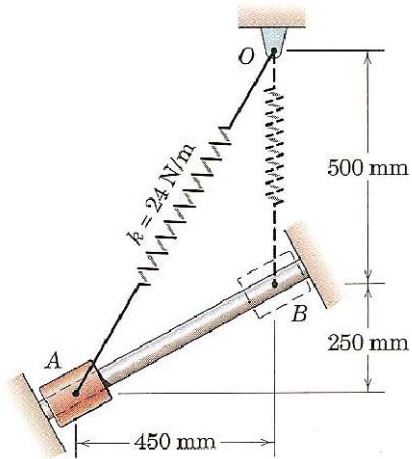
ID NUMBER:

90 MINUTES CLOSED BOOK QUIZ

1. ANSWER ALL THE FOLLOWING QUESTIONS IN THE GIVEN SPACE ON THIS QUESTION BOOKLET
 2. THE SCRATCH BOOKLET WILL NOT BE COLLECTED AND HENCE WILL NOT BE GRADED
 3. CLARITY AND NEATNESS ARE IMPORTANT FOR GRADING
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PROBLEM 1: 25%

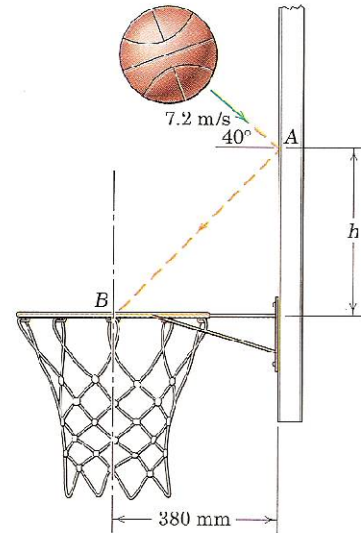
The 0.9 kg collar is released from rest at A and slides freely up the smooth inclined rod (in the vertical plane), striking the stop at B with a velocity v . The spring of stiffness $k = 24 \text{ N/m}$ has an unstretched length of 375 mm. Calculate v . Include any relevant diagrams.



PROBLEM 2: 20%

A basketball traveling with the velocity shown in the figure strikes the backboard at A. If the coefficient of restitution for this impact is $e = 0.84$:

a. Draw the impulse and momentum diagram of the basketball (5 pts)

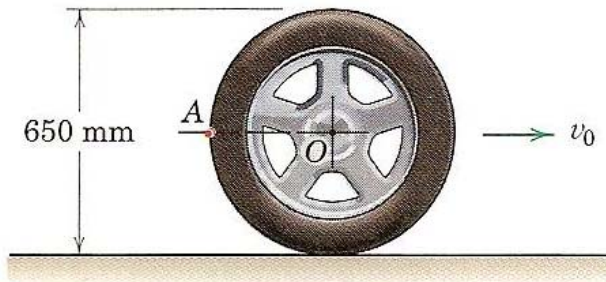


b. Determine the magnitude of the velocity of the basketball and its direction with the backboard just after impact. (15 pts)

PROBLEM 3: 25%

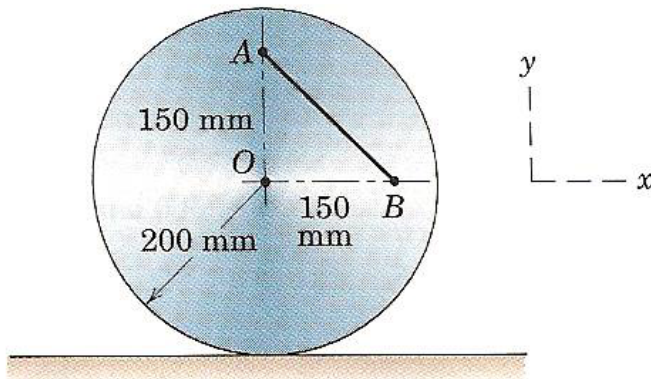
Part A: (10 pts)

The magnitude of the absolute velocity of point A on the automobile tire is 12 m/s when A is in the position shown. What are the corresponding velocity v_0 of the car and the angular velocity ω of the wheel? The wheel rolls without slipping.



Part B: (15 pts)

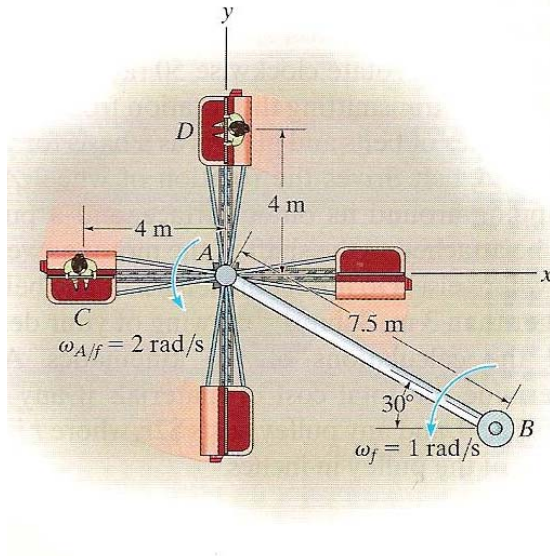
The circular disk rolls to the left without slipping. If $\mathbf{a}_{A/B} = -2.7\mathbf{j} \text{ m/s}^2$, determine the velocity and acceleration of the center O of the disk.



PROBLEM 4: 30%

The cars on the amusement-park ride rotate around the axle at A with a constant angular velocity $\omega_{A/f} = 2 \text{ rad/s}$, measured relative to the frame AB. At the same time the frame rotates around the main axle support at B (which is fixed) with a constant angular velocity $\omega_f = 1 \text{ rad/s}$.

- (a) Determine the velocity and acceleration of point A- express your answer in the Cartesian vector form. (15 pts)



- (b) Determine the velocity and acceleration of the passenger at point D- express your answer in the Cartesian vector form.(15 pts)