

NAME:

ID No:

March 24, 2007

**90 minutes closed book quiz**

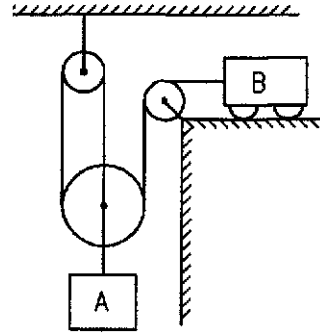
- 1- Solve the problems on the question sheets.
- 2- Write your solution in the given space.
- 3- Use the scratch booklet before writing on the question sheet.
- 4- The scratch booklet will not be collected and will not be graded.
- 5- Dirty papers will not be corrected.

No.1– (25%)

Consider the system of blocks and pulleys shown in the figure. Block B has a leftward velocity of 1.2 m/s.

15% 1- Determine the velocity of block A.

**Solution:**



10% 2- Block A has a mass of 1 kg and block B has a mass of 2 kg. B starts its motion with a leftward velocity of 1.2 m/s. Determine the speed of block A when B has moved 1 m leftward. Neglect friction.

**Solution:**

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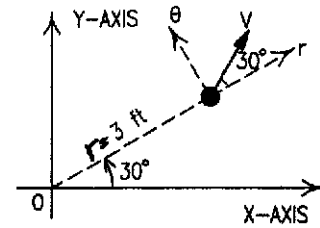
Problem No. 1 – Part 2 continued

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**No. 2 – (25%)**

For the instant represented, the particle has a velocity  $v=6$  ft/s in the direction shown and has an acceleration component  $a_x=15$  ft/s<sup>2</sup> and  $a_y=0$  ft/s<sup>2</sup>.



5% 1- Determine  $a_r$ .

**Solution:**

5% 2- Determine  $a_\theta$ .

**Solution:**

5% 3- Draw the tangential and normal (t,n) axes on the above figure and determine  $a_t$ .

**Solution:**

5% 4- Determine  $a_n$ .

**Solution:**

5% 5- Determine the radius of curvature of the path for this position.

**Solution:**

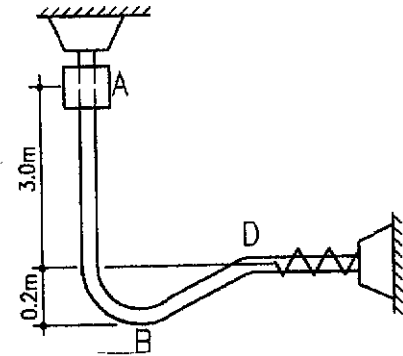
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No. 3 – (25%)

The 1.2-kg slider is released from rest in position A and slides without friction along the vertical-plane guide shown. The spring has a stiffness of 24000N/m and is initially unstretched.

10% 1- Draw the work free body diagram of the collar just after it hits the spring



**Solution:**

5% 2- Determine the speed of the slider at B.

**Solution:**

10% 3- Determine the maximum compression of the spring.

**Solution:**

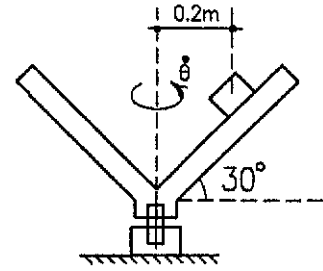
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No. 4 – (25%)

Consider the 1-kg small object placed on the inner surface of the conical dish at the radius shown. The coefficient of static friction between the object and the conical surface is 0.3. Assume that the speed changes are made slowly so that any angular acceleration may be neglected.



10% 1- Draw the free body diagram and the kinetic diagram of the object for the position shown based on the next question.

**Solution:**

15% 2- Determine the maximum constant angular velocity that the object can have so that it does not slip up the inner surface.

**Solution:**