# UNIVERSITI TUN HUSSEIN ONN MALAYSIA

## FINAL EXAMINATION
## SEMESTER II
## SESION 2010/2011

| | | |
|---|---|---|
| COURSE NAME | : | ENGINEERING MECHANICS |
| COURSE CODE | : | BDU10503 |
| PROGRAM | : | SARJANA MUDA TEKNOLOGI KEJURUTERAAN AEROUNATIK (JURUTERBANG PROFESIONAL) DENGAN KEPUJIAN |
| EXAMINATION DATE | : | APRIL / MAY 2011 |
| DURATION | : | 3 HOURS |
| DIRECTION | : | ANSWER **THREE (3)** OUT OF FOUR (4) QUESTIONS IN PART A AND **ONE (1)** OUT OF TWO (2) QUESTIONS IN PART B |

THIS QUESTION PAPER CONTAINS TEN (10) PAGES

**PART A: Answer Three Out of Four problems.**

**Q1. (a)** Given a bracket as shown in the Figure Q1.a. There are two forces $F_A$ and $F_B$ are acting through point O in the direction as shown in that figure. Force $F_A$ is equal to 700 N and $F_B$ is equal to 600 N. Follows figure Q1.a, the force $F_B$ makes an angle $\theta = 20^0$. Determine the magnitude and angle measured counterclockwise from the positive y – axis of the resultant force acting on the bracket.

**(5-Marks)**

**(b)** A box hanged out by three ropes as depicted in the Figure Q1.b. Determine the magnitude and direction $\theta$ of Force $\mathbf{F}_1$ so that the resultant force is directed vertically upward and has a magnitude of 800 N.

**(10-Marks)**

**(c)** A cable connection system with a spring as shown in Figure Q1.c. The spring has a stiffness of k = 800 N/m and an unstretched length of 200 mm. Determine force in cables BC and BD when the spring is held in the position is shown in the Figure.

**(10-Marks)**

**Q2 (a)** Determine the tension in each cord used to support the 150 kg crate as shown in the Figure Q2.a. Assume that the acceleration gravitation g is 9.81 m/sec$^2$.

**(10-Marks)**

**(b)** The shear leg derrick is used to haul the 200 kg net of fish onto the dock. Determine the compressive force along each of legs AB and CB and the tension in winch cable DB. Assume the force in each leg acts along its axis and the gravitational acceleration g = 9.8 m/sec$^2$.

**(15-Marks)**

**Q3 (a)** Determine the resultant couple moment acting on the beam as shown in the Figure Q3.a. Solve the problem two ways: (a) sum moments about point O and (b) sum moments about point A.

**(10-Marks)**

**(b)** Replace the force and couple moment system acting on the overhang beam as depicted in the Figure Q3.b by a resultant force and couple moment at point A

**(15-Marks)**

**Q4 (a)** Determine the resultant force and specify where it acts on the beam measured from A for the beam structure as given in Figure Q4.a.

**(10-Marks)**

**(b)** Draw the free body diagram of the beam (Figure Q4.b) which support the 80 Kg load and is supported by the pin at A and a cable which wraps around the pulley at D. Explain the significance of each force on the diagram.

**(15-Marks)**

**PART B : Answer One Out of Two Problems**

**Q5 (a)** Two bars OP and PQ in Figure S5.a rotate in the x-y plane with constant angular velocities. In term of the Fixed coordinate system shown that figure. Determine the acceleration of point Q relative to the fixed point O.

**(10-Marks)**

**(b)** A smooth 2 – kg collar C, shown in Figure Q5.b is attached to a spring having a stiffness k = 3 N/m and an unstretched length of 0.75 m. If the collar is released from the rest at A . Determine its acceleration and the normal force of the rod on the collar at the instant y = 1 m.

**(15-Marks)**

**Q6 (a)** The 100 kg block A as shown in the Figure Q6.a is released from the rest. If the masses of the pulleys and the cord are neglected. Determine the speed of the 20 kg block B in 2 sec.

**(10-Marks)**

**(b)** The 10 kg block shown in Figure Q6.b rests on the smooth incline. If the spring is Originally stretched 0.5 m. Determine the total work done by all the forces acting on the block when a horizontal force P = 400 N pushes the block up the plane s = 2 m.

**(15-Marks)**

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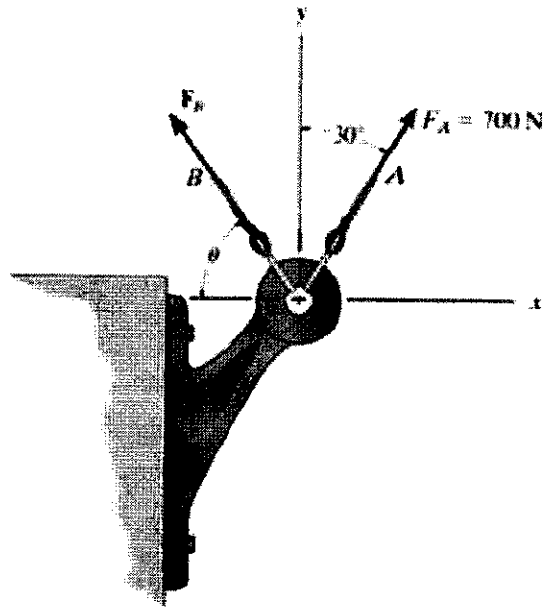


**Figure Q1.a**

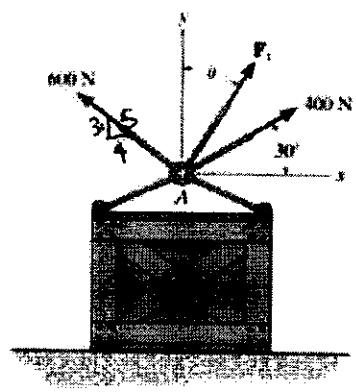


**Figure Q1.b**

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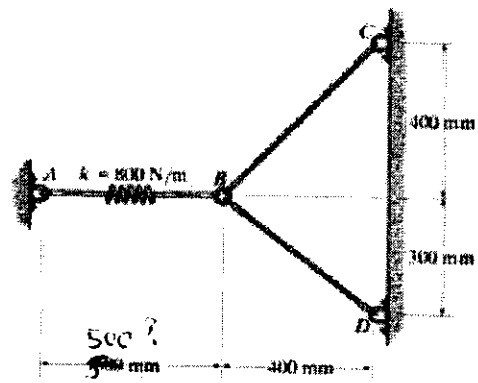


**Figure Q1.c**

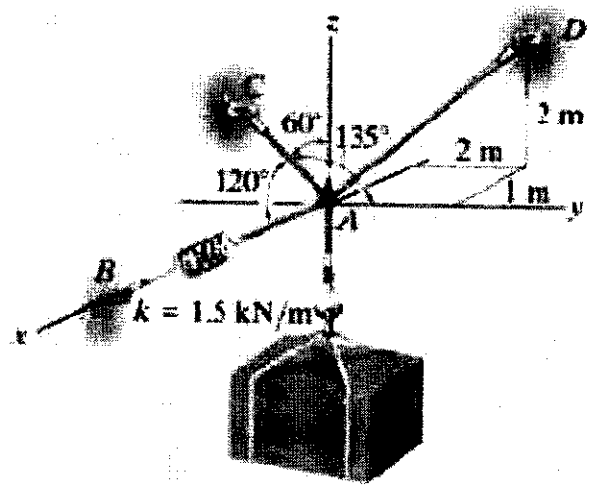


**Figure Q2.a**

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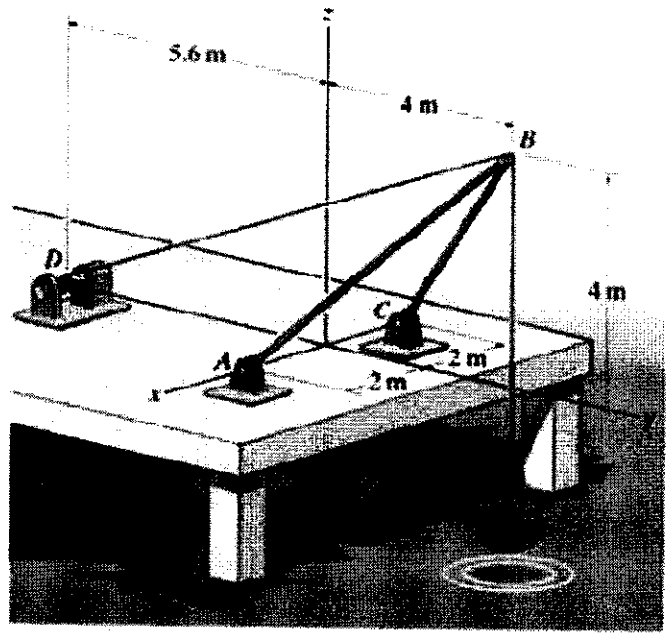


**Figure Q2.b**

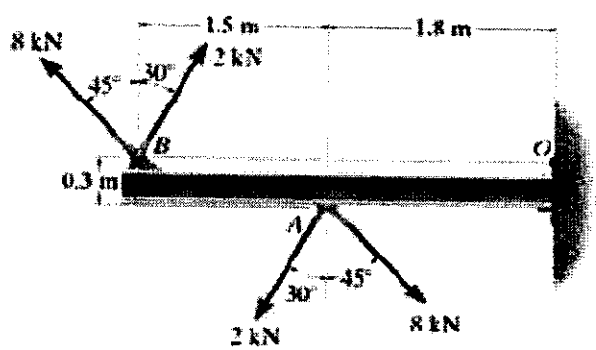


**Figure Q3.a**

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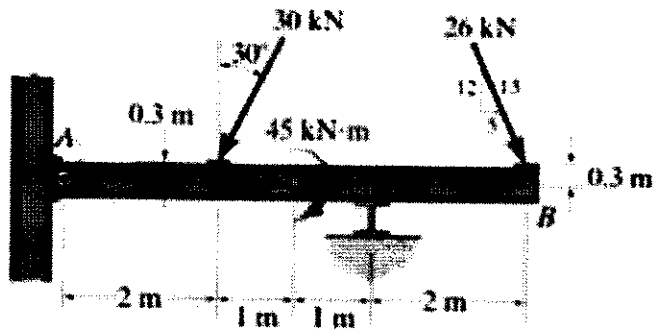


**Figure Q3.b**

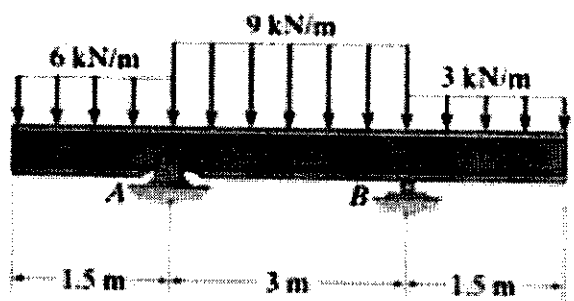


**Figure Q4.a**

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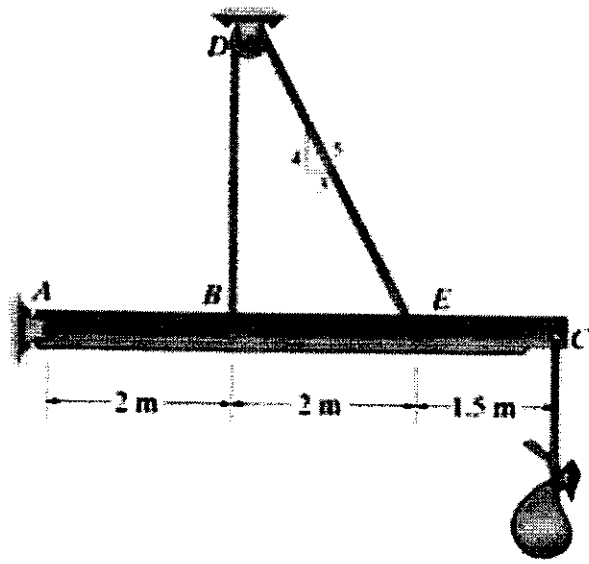


**Figure Q4.b**

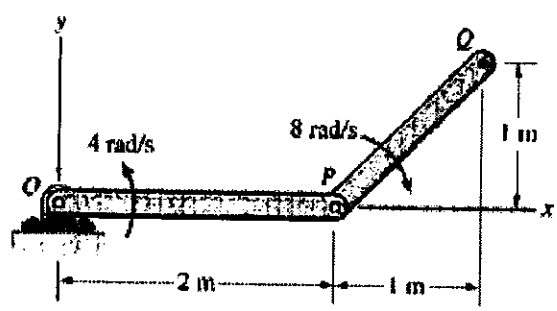


**Figure Q5.a**

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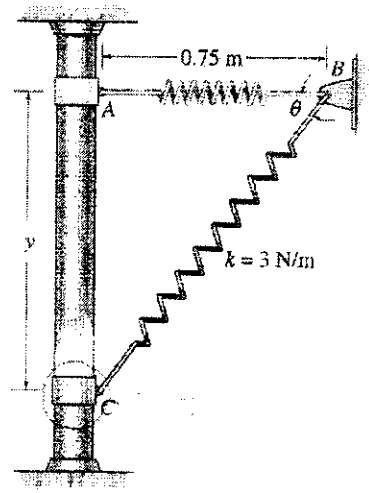


**Figure Q5.b**

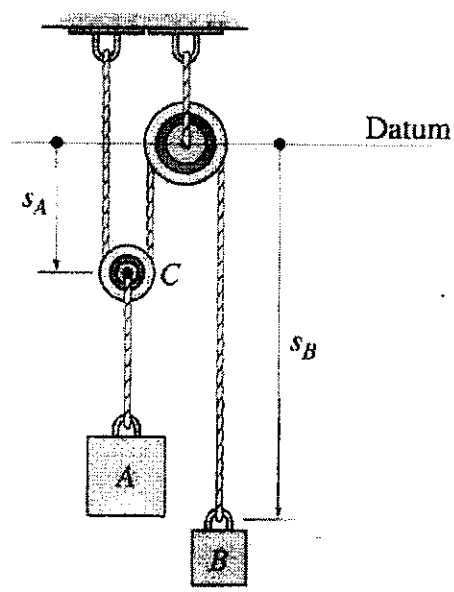


**Figure Q6.a**

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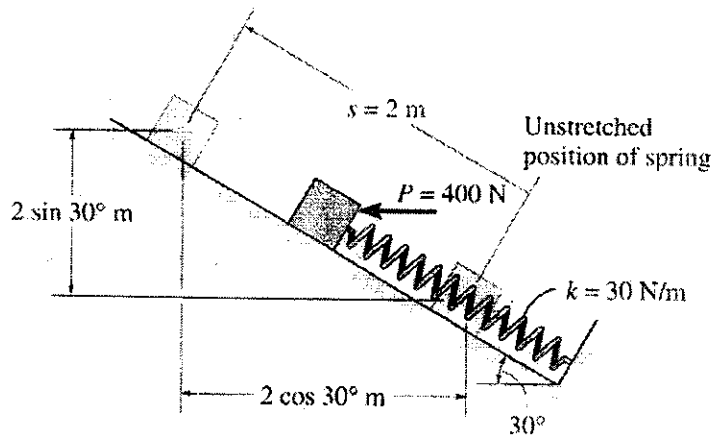


**Figure Q6.b**