



UTHM

Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION SEMESTER II SESSION 2018/2019

COURSE NAME : ENGINEERING MECHANICS
COURSE CODE : BDU 10503
PROGRAMME CODE : 1 BDC / 1 BDM
EXAMINATION DATE : JUNE / JULY 2019
DURATION : 3 HOURS
INSTRUCTION : ANSWER ONLY **FOUR (4)** QUESTIONS
1. ANSWER **TWO (2)** QUESTIONS FROM
SECTION A
2. ANSWER **TWO (2)** QUESTIONS FROM
SECTION B

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

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SECTION A

- Q1** (a) The link shown in **Figure Q1(a)** is subjected to three forces. Using scalar notation, determine:
- (i) the magnitude of the resultant force.
 - (ii) the direction of the resultant force, measured clockwise from the positive x axis.
- (9 marks)
- (b) Two forces acting on a flag pole as shown in **Figure Q1(b)**. If $F_B = 560\text{ N}$ and $F_C = 700\text{ N}$. Determine:
- (i) the magnitude of the resultant force.
 - (ii) the coordinate direction angles for the resultant force acting on the flag pole.
- (16 marks)
- Q2** (a) Replace the three forces acting on the shaft shown in **Figure Q2(a)** by a single resultant force. Determine:
- (i) the magnitude of the resultant force.
 - (ii) the location where the force acts, measured from end B.
- (9 marks)
- (b) Replace the two wrenches and the force, acting on the pipe assembly shown in **Figure Q2(b)**, by an equivalent resultant force and couple moment at point O.
- (16 marks)
- Q3** A truss is subjected to two loads as shown in **Figure Q3**. By setting $P_1 = 10\text{ kN}$ and $P_2 = 8\text{ kN}$:
- (a) determine the force in each member of the truss. (15 marks)
 - (b) state if the members are in tension or compression. (5 marks)
 - (c) sketch the free-body diagram of each joint. (5 marks)

SECTION B

- Q4** (a) Describe briefly the following terms.
(i) Kinematic
(ii) Kinetic
(4 marks)
- (b) **Figure Q4(b)** shows jet plane is travelling at a speed of 120 m/s then decreasing to 40 m/s² when it reaches point A. Determine:
(i) The magnitude of its acceleration when it is at point A.
(ii) The direction of flight measured from the x axis when it reached point A.
(10 marks)
- (c) At the instant shown in **Figure Q4(c)**, car A has a speed of 20 km/h, which is being increased at the rate of 300 km/h² as the car enters an expressway. At the same instant, car B is decelerating at 250 km/h² while traveling forward at 100 km/h. Determine the velocity and acceleration of A with respect to B.
(11 marks)
- Q5** (a) Describe the term “inertial reference frame”.
(3 marks)
- (b) Explain the differences of “mass” and “weight” of a matter.
(3 marks)
- (c) A bob of the pendulum is released from rest at the horizontal position shown in **Figure Q5(b)**. If the mass of the bob is 0.2 kg and the length of the cord is 0.8 m, at the instant the bob passes through its lowest position, determine:
(i) its speed.
(ii) the tension in the cord.
(8 marks)
- (d) The 100 kg block A as shown in the **Figure Q5(c)** 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 seconds.
(11 marks)

- Q6** (a) Describe briefly the following terms.
- (i) Impulse
 - (ii) Conservation of momentum
 - (iii) Conservation of energy
- (6 marks)
- (b) A 0.5 kg drone shown in **Figure Q6(b)** is taking off from ground vertically by exerting a constant vertical force 6 N from all its propellers to the ground. After 5 s, determine:
- (i) its velocity.
 - (ii) how high it goes in 5 s.
- (9 marks)
- (c) The 10 kg block shown in **Figure Q6(c)** 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.
- (10 marks)

-END OF QUESTIONS -

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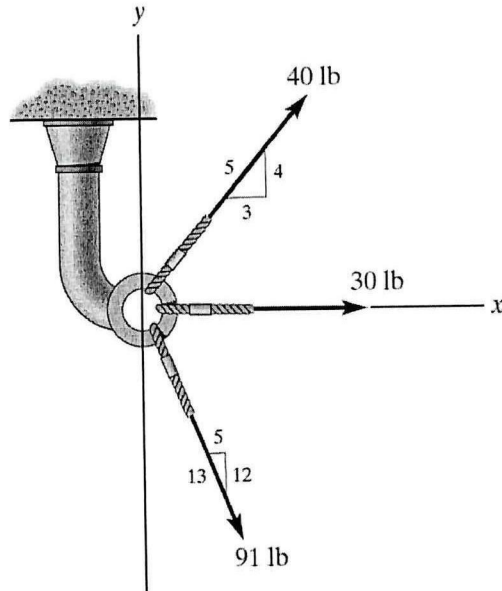


Figure Q1(a)

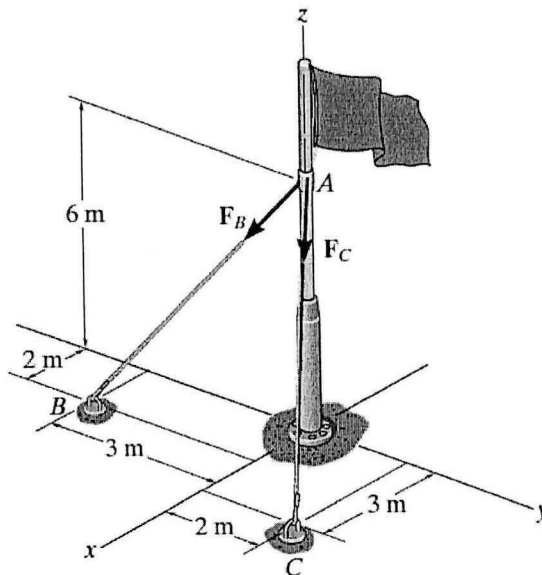


Figure Q1(b)

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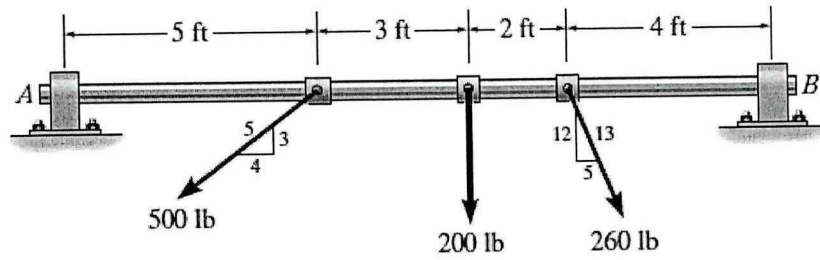


Figure Q2(a)

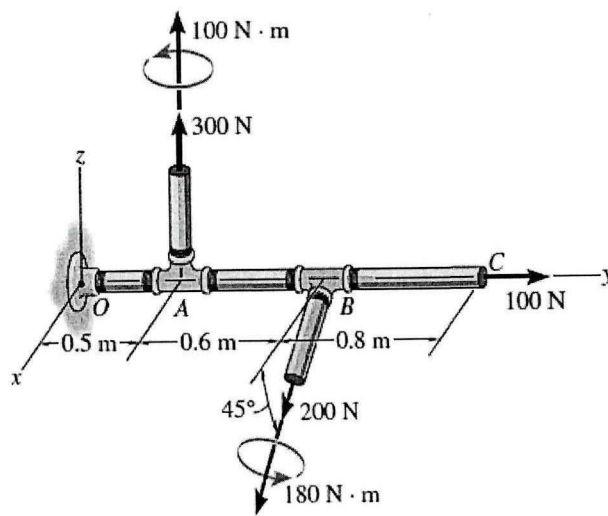


Figure Q2(b)

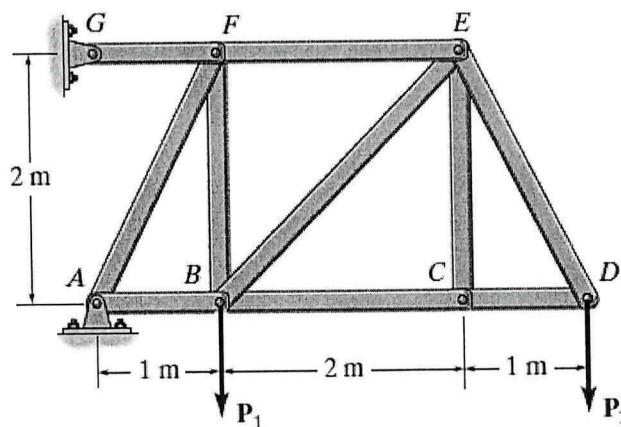


Figure Q3

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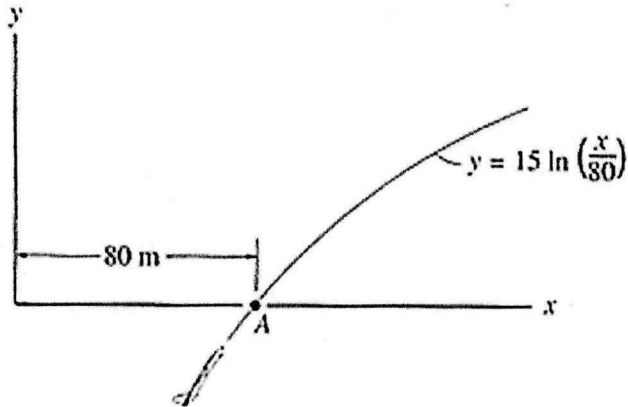


Figure Q4(b)

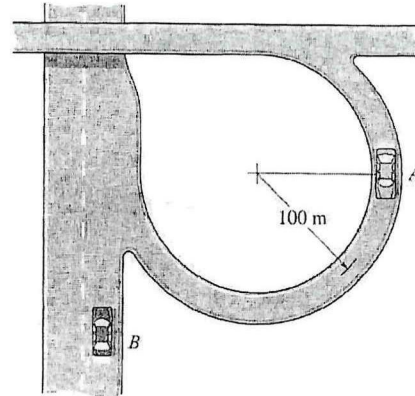


Figure Q4(c)

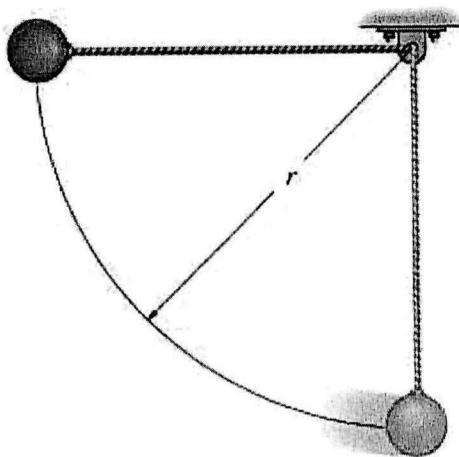


Figure Q5(b)

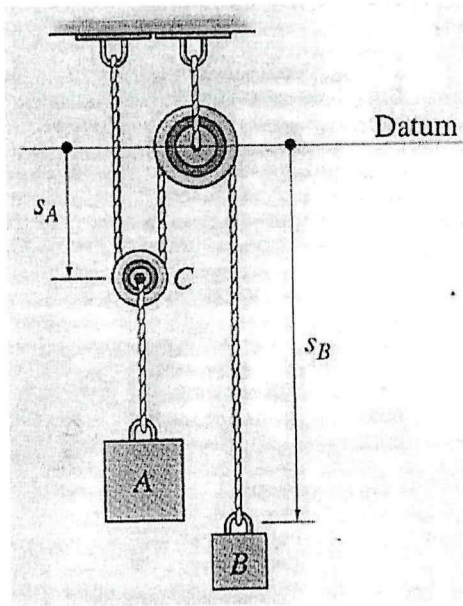


Figure Q5(c)

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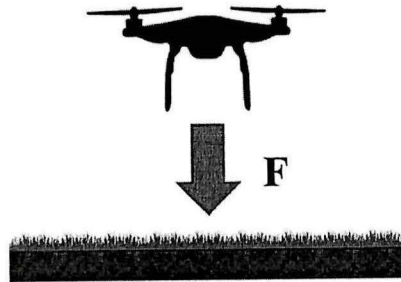


Figure Q6(b)

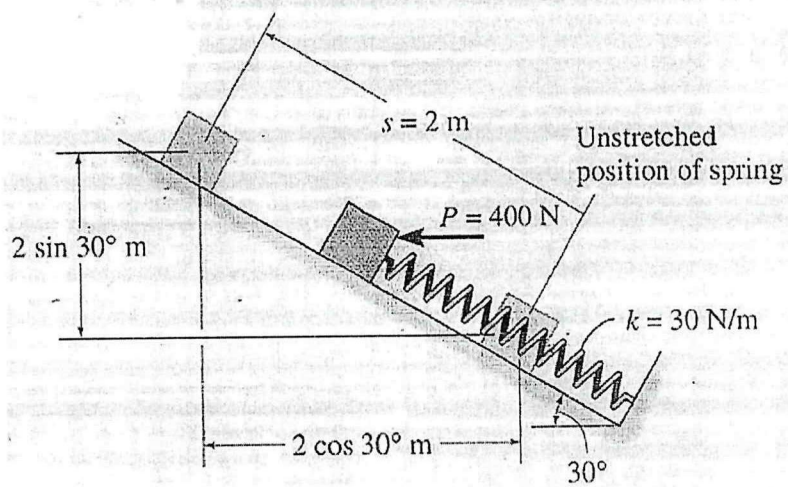


Figure Q6(c)