Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2019/2020

COURSE NAME	:	ENGINEERING MECHANICS
COURSE CODE	:	BDX 10603
PROGRAMME	:	BDX
DATE	:	JULY 2020
DURATION	:	3 HOURS
INSTRUCTIONS	:	ANSWER **FIVE (5)** QUESTIONS ONLY OUT OF **SIX (6)** QUESTIONS **OPEN BOOK EXAMINATION**

THIS QUESTIONS PAPER CONSIST OF **SEVEN (7)** PAGES

Q1 A statics experimental setup as shown in **Figure Q1** is mounted at a concrete wall. Point *B* and *C* which are holding the cable are connecting at the same point of *A*. A weighing block hanging at point *A* produce a tension of 560 *N* along the *AB* cable.

(a) Express the unit vectors of U_{AB} and U_{AC}. (6 marks)

(b) Calculate the force vector of F_{AB}. (4 marks)

(c) Using a Vector Dot Product, distinguish the magnitude projected component of the force acting along *AC* cable. (6 marks)

(d) Solve the projected component in cartesian vector. (4 marks)

Q2 (a) **Figure Q2(a)** shows forces acting at column which is mounted at floor. Examine and locate the resultant force measuring from point A

(10 marks)

(b) Distinguish the distributed loading as shown in **Figure Q2(b)** with an equivalent resultant force, and specify its location on the beam measured from A.

(10 marks)

Q3 An Architect had proposed a construction design drawing of a roof truss as illustrated in **Figure Q3**. As a Design Engineer you need to analyze the force acting on the truss. Assuming the horizontal components of force at the support are neglected;

(a) Calculate the reaction force of F_A and F_G.

(5 marks)

(b) Sketch the force acting at section *1-1* and *2-2*.

(5 marks)

(c) Examine the force along truss *CD* and *DE*.

(5 marks)

(d) Using the method of joint at point *D*, distinguish the force acting along *DJ*, F_{DJ}.

(5 marks)

Q4 (a) Differentiate between kinetics and kinematics.

(4 marks)

(b) Sketch and explain three types of rigid body motions.

(6 marks)

(c) In **Figure Q4(c)**, the link AB has an angular velocity of $\omega = 3$ rad/s and $\theta = 45°$.

i) Sketch the kinematic diagram of link AB and BC.

(2 marks)

ii) Determine the velocity of block C.

(4 marks)

iii) Determine the angular velocity of link BC.

(4 marks)

Q5 **Figure Q5** shows a system consists of 45 kg block A, 5 kg cylinder B and 11 kg block C. Suppose block A pulls the system down a smooth ramp, and the coefficient of kinetic friction between the horizontal surface and block C $(\mu k)_c$ is 0.2;

(a) Draw the Kinetic Diagram of block A, cylinder B and block C

(12 marks)

(b) Determine the acceleration of the system and the tension in each cable

(8 marks)

Q6 (a) Differentiate between impact in particles and impact in rigid body.

(6 marks)

(b) **Figure Q6(b)** shows a fighter jet plane P is flying along a straight path, while aerobatic plane Q is flying along a circular path having a radius of curvature of 300 km. Both plane P and Q are flying at the same altitude. At the instant shown, plane P fly at the velocity of 950 km/hr while plane Q fly at the velocity of 550 km/hr. Also at this instant, plane P has an acceleration of 100 km/hr^2 and plane Q has a deceleration of 250 km/hr^2. The angle between straight path of plane P and the horizontal line is $\theta = 60°$

i) Calculate the magnitude and direction of velocity of plane Q as measured by the pilot of plane P.

(7 marks)

ii) Determine the magnitude and direction of acceleration of plane Q with respect to plane P.

(7 marks)

-END OF QUESTION-

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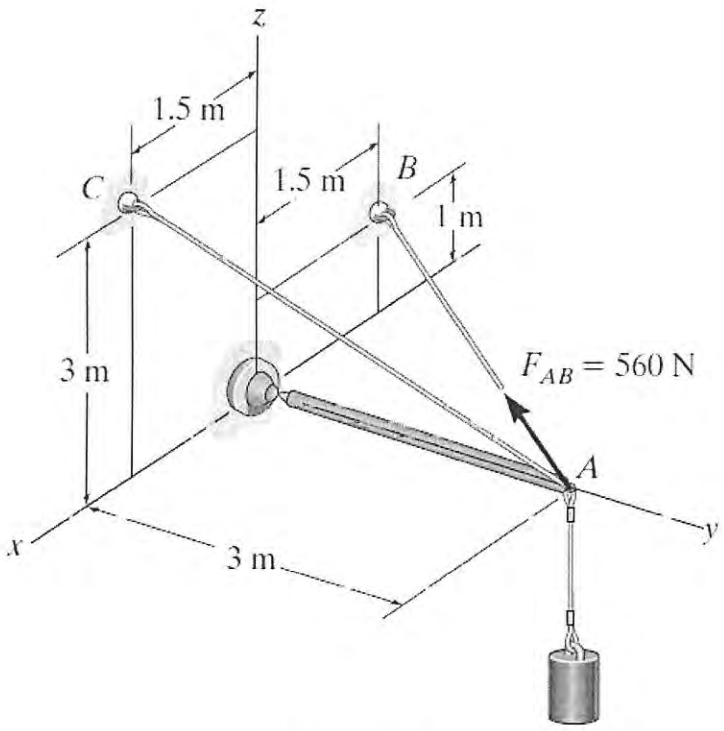

Figure Q1

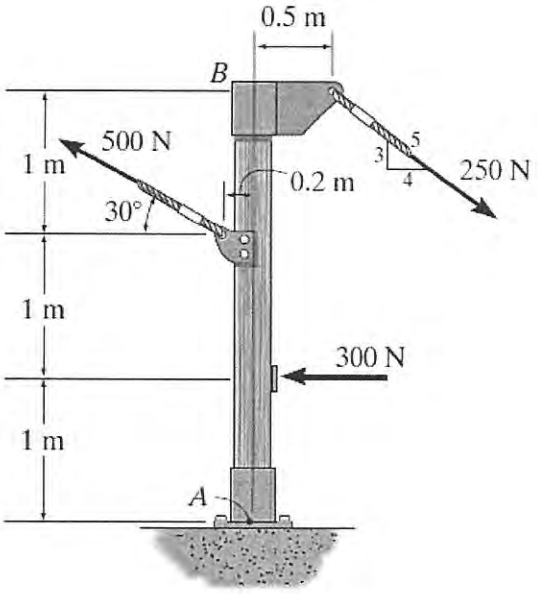

Figure Q2(a)

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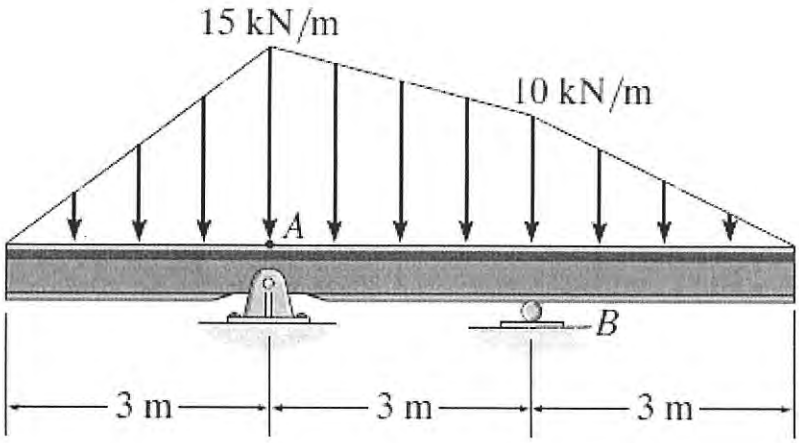

Figure Q2(b)

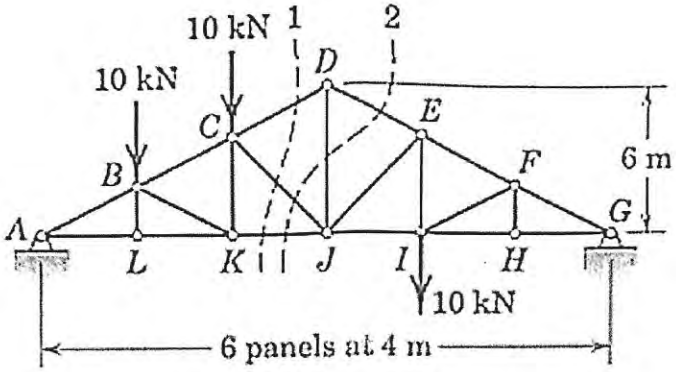

Figure Q3

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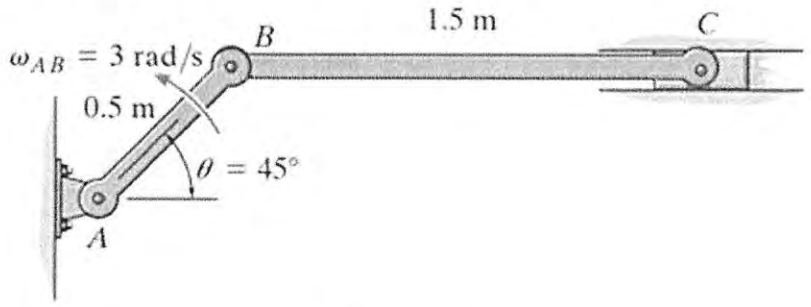

Figure Q4(c)

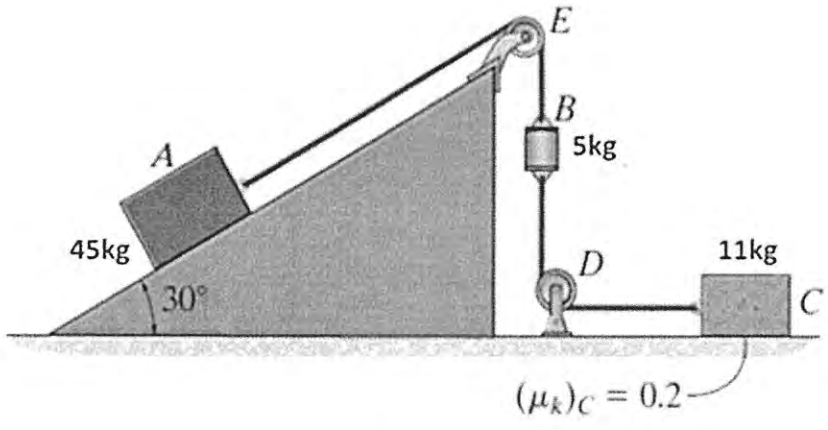

Figure Q5

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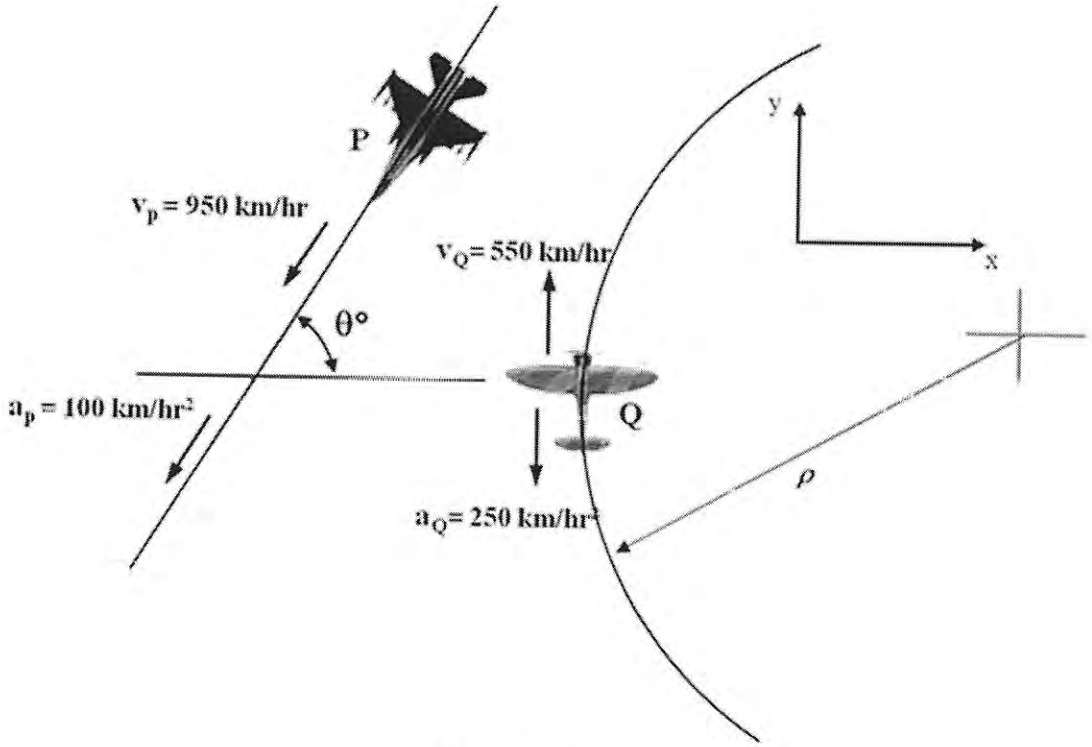

Figure Q6(b)