INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session	:	**August 2019**
Programme	:	Foundation in Science (CFSI)
Course	:	**EGR1203 : ENGINEERING MECHANICS**
Date of Examination	:	13 December 2019 (Friday)
Time	:	11:00AM – 1:00PM Reading Time : Nil
Duration	:	2 Hours
Special Instructions	:	

This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Materials permitted :

Non-Programmable Calculator

Materials provided :

Physics Booklet

Examiner(s) : **Dr. Beh Boon Chun**

Moderator : **Assoc. Prof. Dr. Khoo Bee Ee**

This paper consists of 8 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

FOUNDATION IN SCIENCE (CFSI)
EGR1203: ENGINEERING MECHANICS
FINAL EXAMINATIONS: AUGUST 2019 SESSION

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Question 1

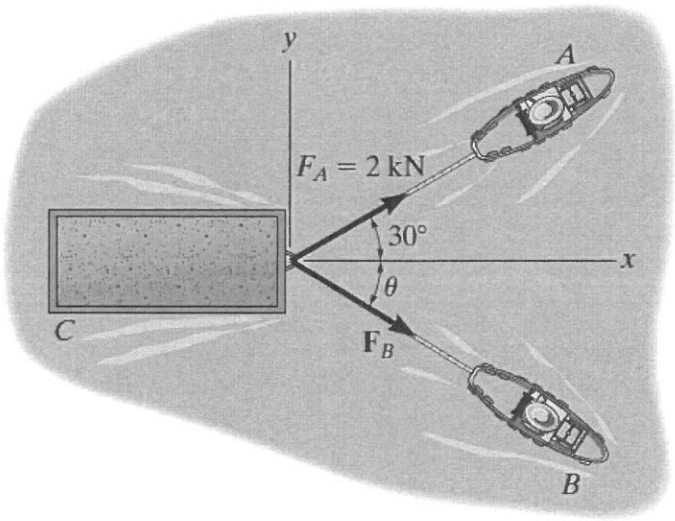

Figure Q1a-b

(a) Referring to Figure Q1a-b, if the resultant force of the two tugboats is 3 kN, directed along the positive x axis, determine the required magnitude of force F_B and its direction θ. (6 marks)

(b) Referring to Figure Q1a-b, if $F_B = 3$ kN and $\theta = 45°$, determine the magnitude of the resultant force of the two tugboats and its direction measured clockwise from the positive x axis.? (7 marks)

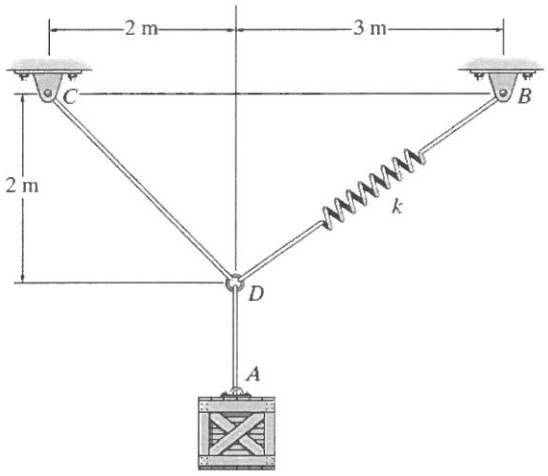

Figure Q1c-d

(c) Referring to Figure Q1c-d, if the spring DB has an unstretched length of 2 m, determine the stiffness of the spring to hold the 40 kg crate in the position shown. (6 marks)

(d) Referring to Figure Q1c-d, determine the unstretched length of DB to hold the 40 kg crate in the position shown. Take $k = 180$ N/m. (6 marks)

Question 2

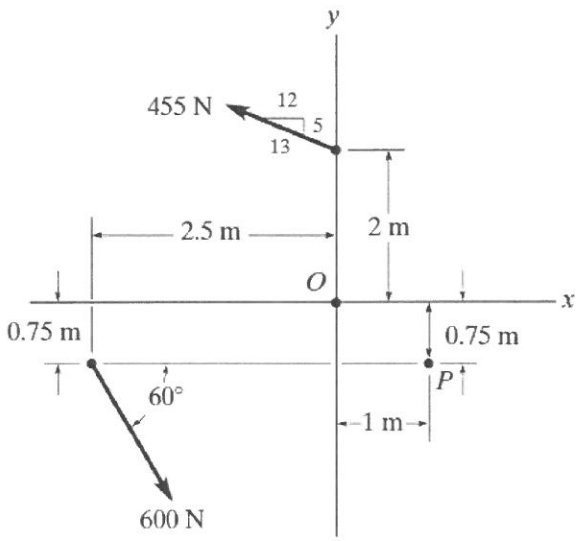

Figure Q2a

(a) Referring to Figure Q1a, replace the force system by an equivalent resultant force and couple moment at point *O*. (12 marks)

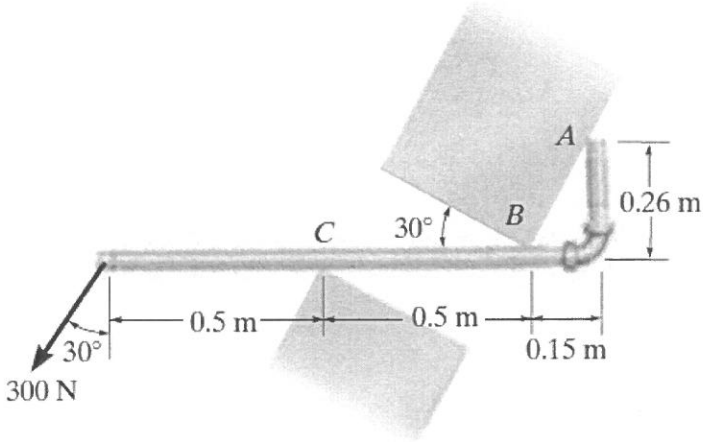

Figure Q2b

(b) Referring to Figure Q2b, the smooth pipe rests against the opening at the points of contact A, B, and C. Determine the reactions at these points needed to support the force of 300 N. Neglect the pipe's thickness in the calculation. (8 marks)

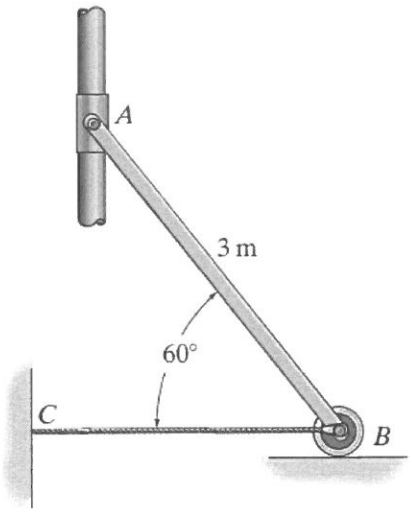

Figure Q2c

(c) Referring to Figure Q2c, the uniform rod AB has a mass of 40 kg. Determine the force in the cable when the rod is in the position shown. There is a smooth collar at A. (5 marks)

Question 3

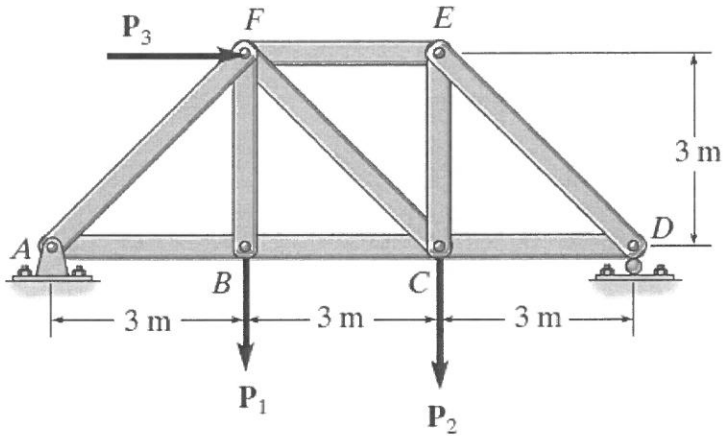

Figure Q3a

(a) Referring to Figure Q3a, determine the force in members EF, BE, BC and BF of the truss and state if these members are in tension or compression. Set $P_1 = 9$ kN, $P_2 = 12$ kN, and $P_3 = 6$ kN. (13 marks)

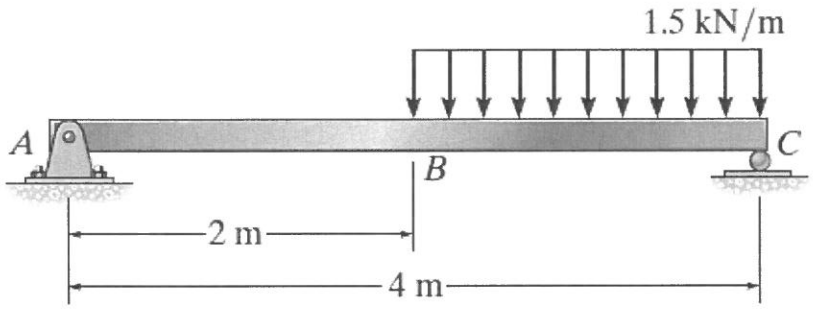

Figure Q3b

(b) Referring to Figure Q3b, draw the shear and moment diagrams for the beam. (12 marks)

Question 4

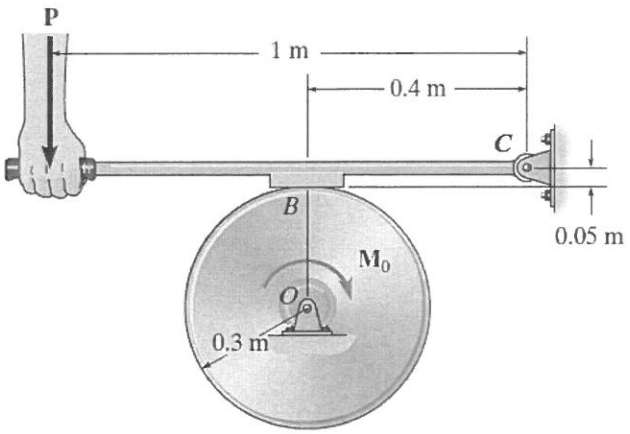

Figure Q4a-b

(a) Referring to Figure Q4a-b, the block brake is used to stop the wheel from rotating when the wheel is subjected to a couple moment M_0 = 360 N.m. If the coefficient of static friction between the wheel and the block is μ_s = 0.6, determine the smallest force P that should be applied. (8 marks)

(b) Referring to Figure Q4a-b, determine the smallest force P that should be applied if the couple moment M_0 = 360 N.m is applied **counterclockwise** and the coefficient of static friction between the wheel and the block is μ_s = 0.6. (8 marks)

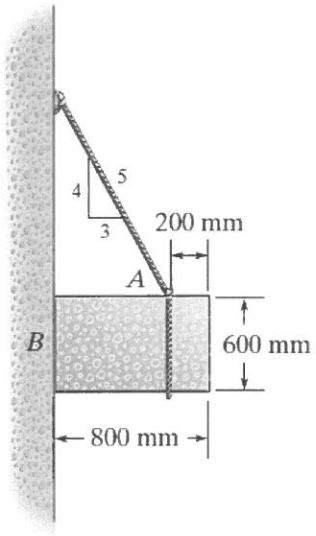

Figure Q4c

(c) Referring to Figure Q4c, the uniform block has a mass of 500 kg, and the coefficient of static friction is μ_s = 0.3. Determine whether the equilibrium can be maintained. (9 marks)

Question 5

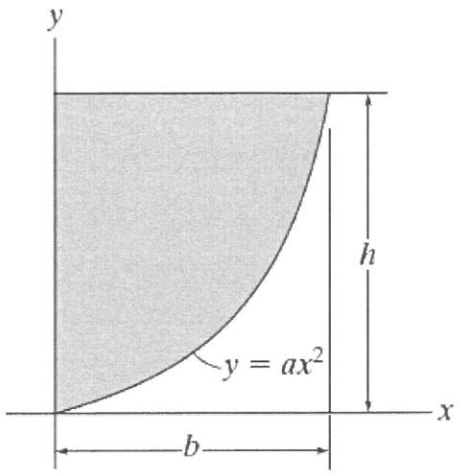

Figure Q5a

(a) Locate the centroid $\bar{x}$ of the parabolic area as shown in Figure Q5a. (8 marks)

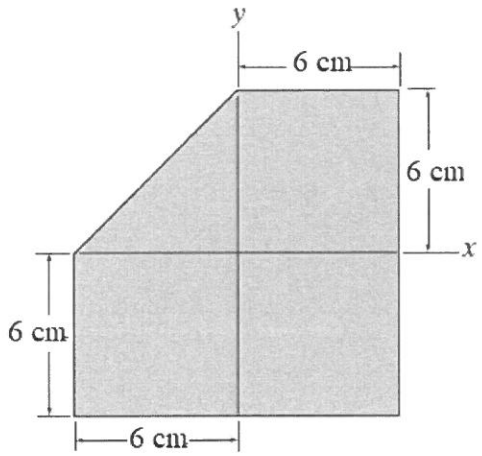

Figure Q5b

(b) Locate the centroid $(\bar{x}, \bar{y})$ of the shaded area as shown in Figure Q5b. (8 marks)

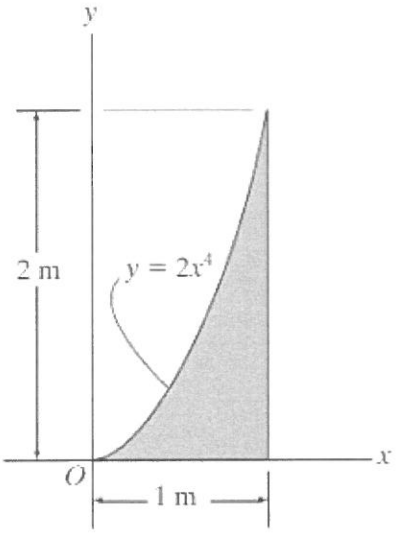

Figure Q5c

(c) Determine the polar moment of inertia of the area as shown in Figure Q5c about z axis passing through point O. (9 marks)

~ The End ~

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