FINAL
Alternative Assessment

Session	:	**April 2022**
Programme	:	Foundation in Science (CFSI)
Course	:	**EGR1203: Engineering Mechanics**
Date of Examination	:	5 August 2022 (Friday)
Time	:	9:00am – 11:30am Reading Time : Nil
Duration	:	2 hours + 30 minutes (uploading time)
Special Instructions	:	

This paper consists of **FOUR (4)** questions. Answer all questions.
All questions carry equal marks.

Materials permitted :

Non-Programmable Calculator

Materials provided :

Nil

Examiner(s)	:	**Dr. Beh Boon Chun**
Chief Moderator	:	Ms. Nurhakimah Abd Aziz

*This paper consists of **6** printed pages, including the cover page.*

FOUNDATION IN SCIENCE (CFSI)
EGR1203: ENGINEERING MECHANICS
FINAL ALTERNATIVE ASSESSMENT: APRIL 2022 SESSION

Instructions: This paper consists of **FOUR (4)** questions. Answer all questions. All questions carry equal marks.

Question 1

(a) Referring to **Figure Q1(a)**,

(i) Express the components of each force along *u* and *v* axes using Cartesian vector notation. (6 marks)

(ii) Using parallelogram law, determine the magnitude of the resultant force and its direction, measured clockwise from the positive *u* axis. (7 marks)

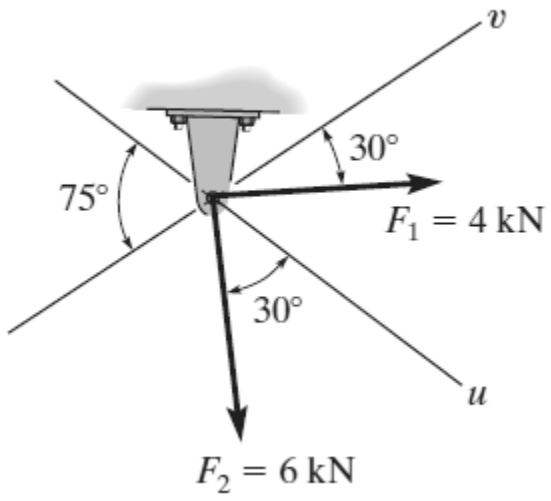

Figure Q1(a)

(b) Referring to **Figure Q1(b)**, a man is being rescued using a boatswain's chair that is suspended from a pulley at *C*. The pulley is free to roll along the cord *ACB* and is pulled at a constant speed by another cord *DC*. Given that $\alpha = 36^{\circ}$, $\beta = 15^{\circ}$ and the total weight of the chair and the man is 880 N, calculate the force exerted in the cord *ACB* and *DC*.

(6 marks)

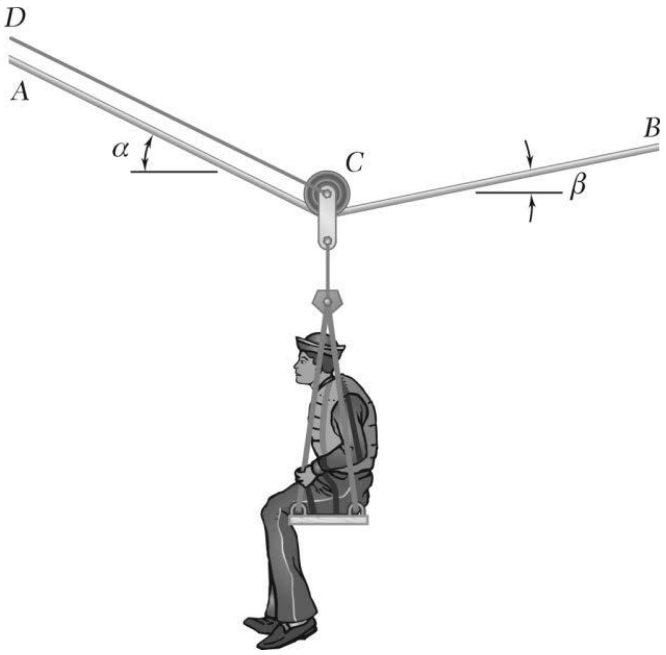

Figure Q1(b)

(c) Referring to **Figure Q1(c)**, a ring of negligible mass is subjected to a downward force of 250 N. Determine the length *l* of cable *CA* so that the force acting in cable *BA* is 180 N.

(6 marks)

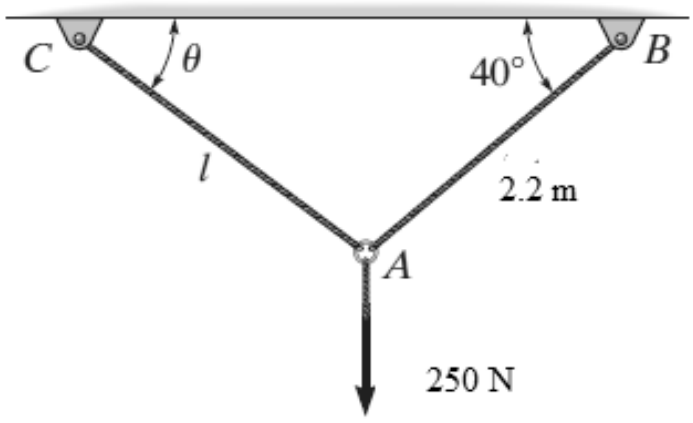

Figure Q1(c)

Question 2

(a) Referring to **Figure Q2(a)**, replace the loading system acting on the post by a resultant force and couple moment at point *O*. Hence, draw the resultant force and couple moment acting at point *O*. (12 marks)

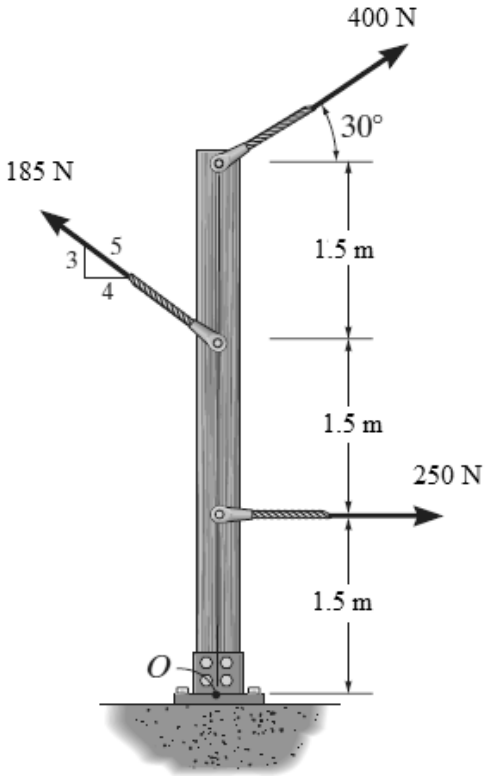

Figure Q2(a)

(b) Referring to **Figure Q2(b)**, determine the reaction support at *A* and *C* when

(i) $\theta = 0^{\circ}$ and (6 marks)

(ii) $\theta = 40^{\circ}$. (7 marks)

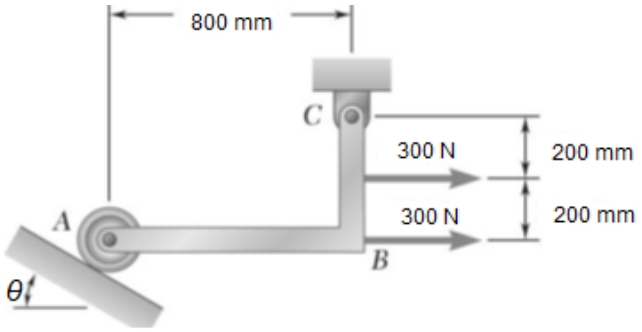

Figure Q2(b)

Question 3

(a) Referring to **Figure Q3(a)**, determine the force in members *BC*, *BE*, *BF* and *FE* of the truss and state if the members are in tension or compression. (13 marks)

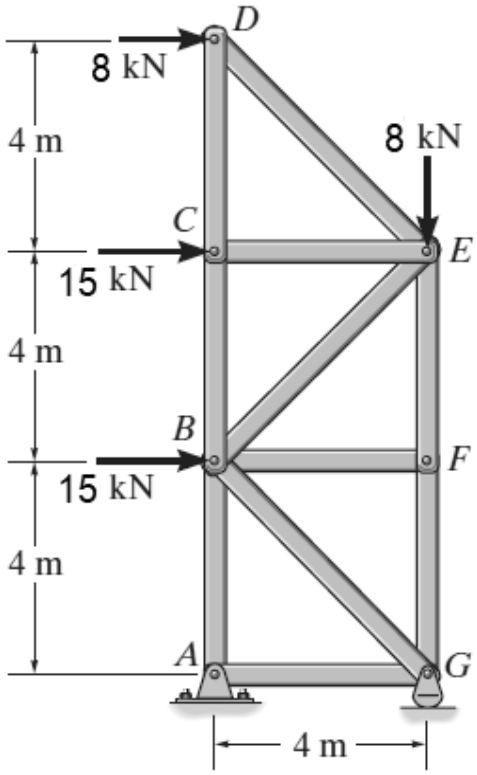

Figure Q3(a)

(b) Referring to **Figure Q3(b)**, draw the shear and bending moment diagram for the beam if L = 6 m. (12 marks)

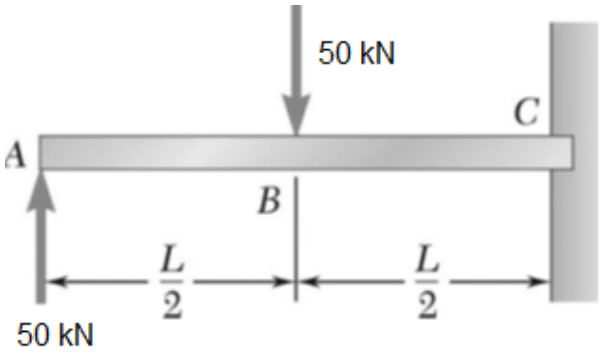

Figure Q3(b)

Question 4

(a) Referring to **Figure Q4(a)**, a horizontal force of P = 200 N is just sufficient to hold the crate from sliding down the plane, and a horizontal force of P = 500 N is required to just push the crate up the plane. Determine the coefficient of static friction between the plane and the crate and calculate the mass of the crate. (12 marks)

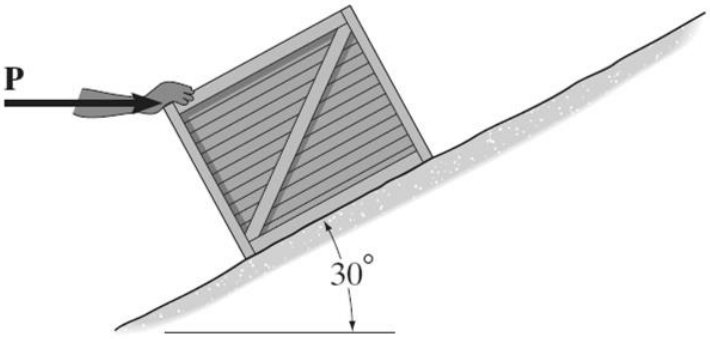

Figure Q4(a)

(b) Referring to **Figure Q4(b)**,

(i) Determine the area and the centroid $(\bar{x}, \bar{y})$ of the shaded area. (8 marks)

(ii) Determine the moment of inertia of the shaded area about the *x* axis. (5 marks)

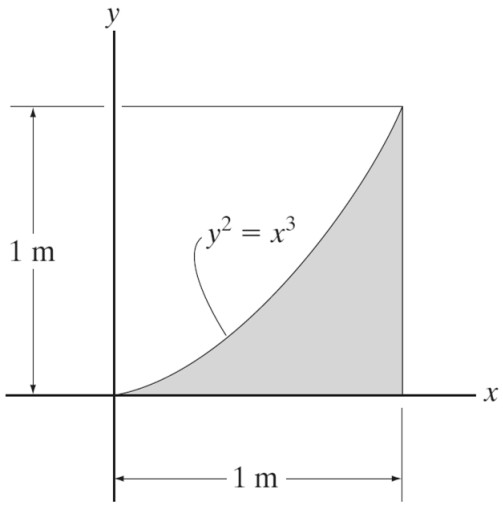

Figure Q4(b)

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