UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	STATICS
COURSE CODE	:	DAM 10703
PROGRAMME CODE	:	DAM
EXAMINATION DATE	:	DECEMBER 2018 / JANUARY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY

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

Q1   (a)   Describe Newton's 1st law.

(4 marks)

(b)   **Figure Q1(b)** shown part of the design of a new sailboat, it is desired to determine the drag force which may be expected at a given speed. To do so, a model of the proposed hull is placed in a test channel and three cables are used to keep its bow on the centerline of the channel. If dynamometer readings indicate that for a given speed, the tension is 40 kN in cable AB and 60 kN in cable AE:

(i)   Determine the drag force exerted on the hull and the tension in cable AC.

(11 marks)

(ii)   Determine the new dimension of **d** so that the force in cable AC is zero. Use drag force from Q1(b) (i).

(5 mark)

Q2   (a)   Describe equilibrium of particle and free body diagram.

(4 marks)

(b)   **Figure Q2(b)** shows four forces act on the pin A:

(i)   If $F_1=150$ N and $\beta =30°$, calculate the magnitude of the resultant force acting on the pin and its direction measured clockwise from the positive x.

(8 marks)

(ii)   If $\beta = 15°$ and resultant force acting on the pin is directed along the positive x-axis. Determine the magnitudes of F_1 and the resultant force.

(8 marks)

Q3   (a)   Explain about Moment in two dimensional (2D)

(4 marks)

(b)   A Steel beam is acted with a force system and couple moment as shown in **Figure Q3(b)**. With applying the method of reduction force system to single force:

(i)   Calculate the equivalent resultant force and its direction
(ii)   Calculate the moment resulting from moving each force to A
(iii)   Determine the location of resultant force along beam AB that measured from A.

(16 marks)

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Q4   (a)   Describe the moment of a couple.

(4 markah)

(b)   A T-shaped column is acted 150 N force at 30° at point C and a distributed loading of 30 N/m on the top as shown in **Figure Q4(b)**. Determine the force of reaction that occurs in each supports of column if the column is in equilibrium.

(16 marks)

Q5   (a)   Describe truss and the assumptions associated to truss.

(4 marks)

(b)   A trusses member of a bridge subjected with 2 kN and 1.5 kN force at point B and C as shown in **Figure Q5(b)**:

(i)   Determine the zero force members and explain why they are the zero force members.

(6 marks)

(ii) Using the method of section, determine the force in member GF, CF and CD.

(10 marks)

Q6   (a)   Briefly explain in which condition centroid coincides with center of gravity.

(4 marks)

(b)   A steel plate plaque of a thickness 3 cm is shaped as in **Figure Q6(b)**. Given the density of the steel plate is 7850 kgm^{-3}, determine its centroid and its weight.

(16 marks)

Q7   (a)   Briefly describe how to reduce friction with example.

(4 marks)

(b)   The mine car and its contents as **Figure Q7(b)** have a total mass of 6 Mg and a center of gravity at G. If the coefficient of static friction between the wheels and the tracks is when the wheels are locked,

(i)   Determine the normal force acting on the front wheels at B and the rear wheels at A when the brakes is locked at both A and B.

(12 marks)

(ii) Elaborate does the car move.

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-END OF QUESTIONS-

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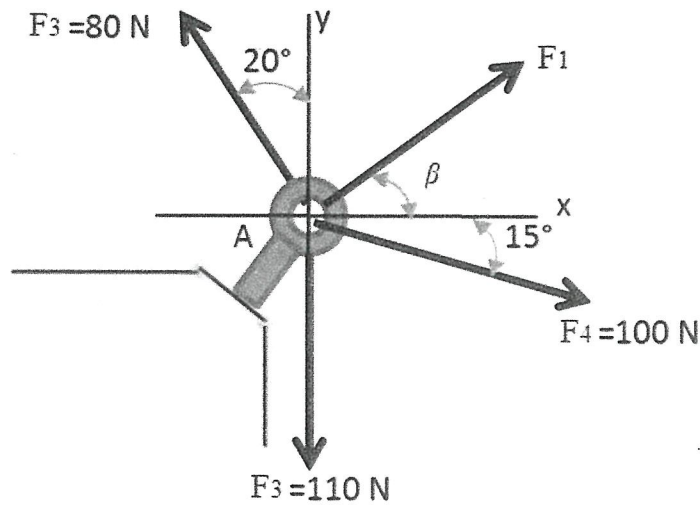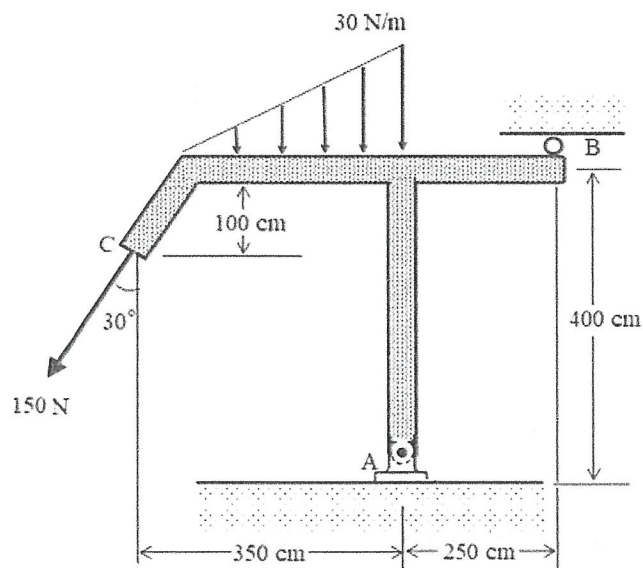| SEMESTER / SESSION | : SEM I / 2018/2019 | PROGRAMME | : DAM |
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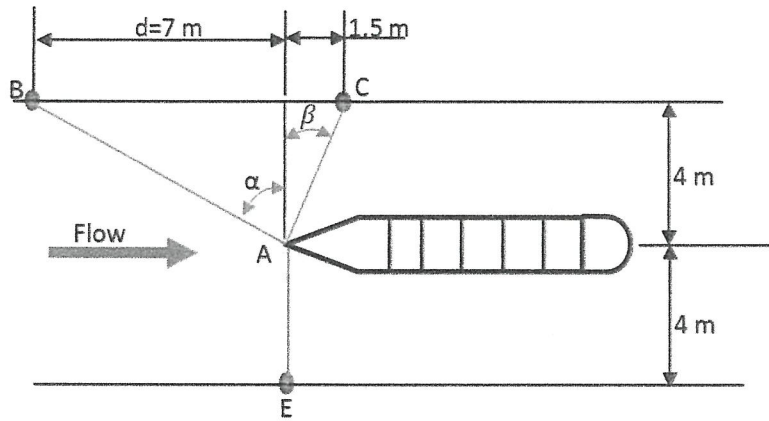
Figure Q1(b) / Rajah S1(b)

Figure Q2(b)

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2 kN

w = 1.5 kN/m

$M_E = 2.44$ kN.m

0.6 m

1.2 kN

─1.0 m─ ─1.2 m─ 0.8 m 1.0 m

Figure Q3(b)

30 N/m

100 cm

400 cm

30°

150 N

350 cm 250 cm

Figure Q4(b)

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Figure Q5(b)

Figure Q6(b)

Figure Q7(b)

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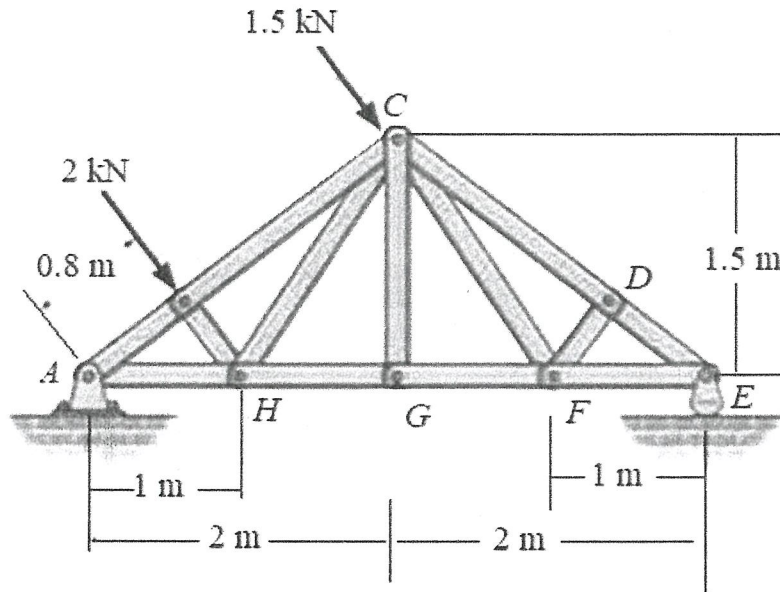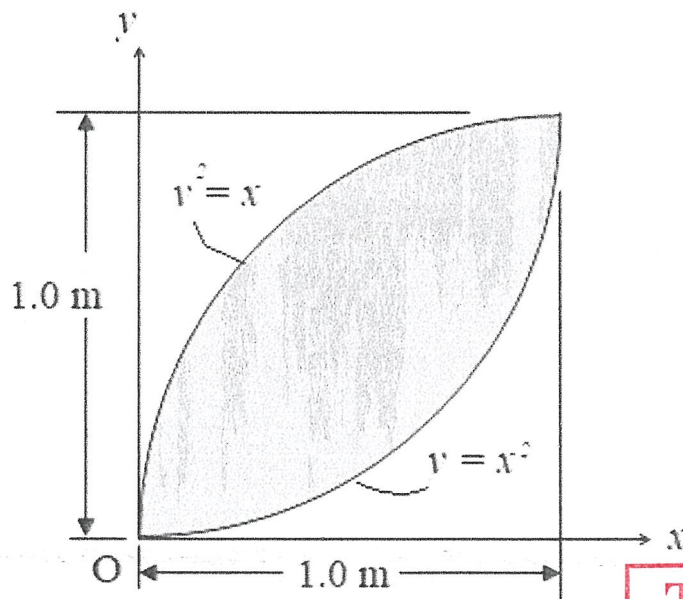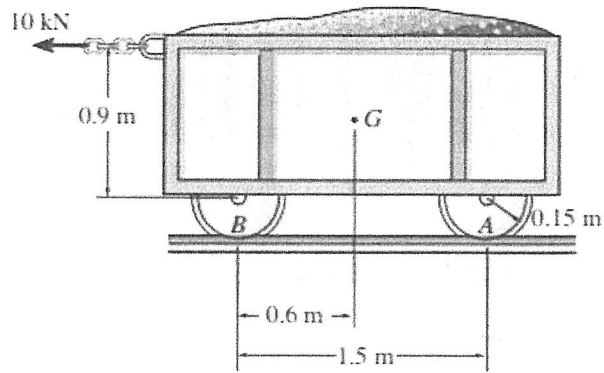
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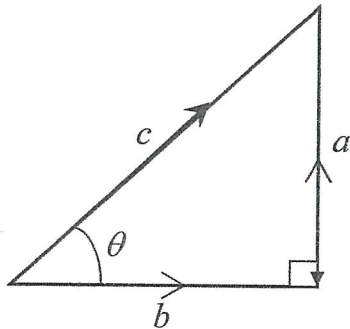|			
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FORMULA:

1. Trigonometry

$$\sin \theta = \frac{a}{c}$$

$$\cos \theta = \frac{b}{c}$$

$$\tan \theta = \frac{a}{b} = \frac{\sin \theta}{\cos \theta}$$

$$\sec \theta = \frac{c}{b} = \frac{1}{\cos \theta}$$

$$\cos ec\theta = \frac{c}{a} = \frac{1}{\sin \theta}$$

$$\cot \theta = \frac{b}{a} = \frac{\cos \theta}{\sin \theta}$$

2. Integration $\int x^n dx = \dfrac{x^{n+1}}{n+1} + C \quad (n \neq -1)$

3. Differentiate $\dfrac{d}{dx} x^n = n^{x-1}$