Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	STATICS
COURSE CODE	:	DAM 10103
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 **Figure Q1** shows three forces are subjecting on a bracket:

(a) Determine the magnitude of force F_1 and angle β so that the resultant force is directed along the u axis and has a magnitude of 820 N.

(12 marks)

(b) If $F_1 = 310\,N$ and $\beta = 10°$, determine the magnitude and direction of the resultant force acting on the bracket measured counterclockwise from the positive x-axis.

(8 marks)

Q2 (a) Describe the condition of Equilibrium of a particle.

(4 marks)

(b) **Figure Q2(b)** shows a ball with a mass of 80 kg is supported by some extension of ropes that tied to the wall. Calculate the tension in each rope which the ball in equilibrium. (Use acceleration of gravity 9.81 m/s^2)

(16 marks)

Q3 (a) State the meaning of Moment.

(2 marks)

(b) **Figure Q3(b)** shows the 2D forces 1 kN, 2 kN and distributed loading 2.5 kN/m with couple system is acting on a steel beam. By neglect the thickness of the beam:

(i) Calculate the single equivalent resultant force and its direction.
(ii) Calculate the position of single equivalent resultant force that measured from point A.
(iii) Determine the magnitude of the reactions on the support A and B.

(18 marks)

Q4 (a) Briefly describe simple truss.

(4 marks)

(b) The bridge truss is subjected to the loading shown in **Figure Q4(b)**:

(i) Sketch the Free Body Diagram (FBD).
(ii) Determine the force in members GF, CF and CD of the bridge truss. Indicate whether the members are in tension or compression.

(16 marks)

Q5 (a) Briefly state the meaning "Center of Gravity".

(2 marks)

(b) Briefly explain in which condition Centroid coincides with Center of Gravity.

(3 marks)

(c) Determine the area and centroid of the shaded area in **Figure Q5(c)**.

(15 marks)

Q6 (a) List **four (4)** causes of friction.

(4 marks)

(b) Three blocks arranged as in **Figure Q6(b)**. The angle of block A is 15° and the coefficient of static friction at all contact surfaces is $\mu s = 0.30$. If the pulley is frictionless, determine the minimum mass, M_1 of block A to start the movement of block B.

(16 Marks)

Q7 (a) The tow truck in **Figure Q7(a)** exerts a force of P = 4 kN on cable along AB. If x=25 m:

(i) Find the moment value.

(ii) Determine the angle θ of the boom so that this force creates a maximum moment about point O.

(7 marks)

(b) Replace the three forces acting on the shaft in **Figure Q7(b)** by a single resultant force. Then determine the direction and position of the resultant force if measured from end A.

(13 marks)

-END OF QUESTIONS-

FINAL EXAMINATION

SEMESTER / SESSION	: SEM I / 2018/2019	PROGRAMME	: DAM
COURSE NAME	: STATICS	COURSE CODE	: DAM 10103

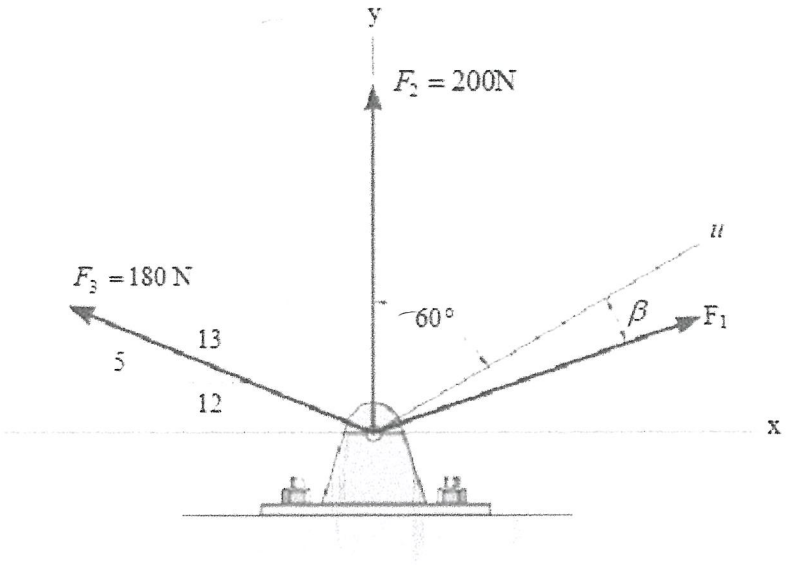


Figure Q1

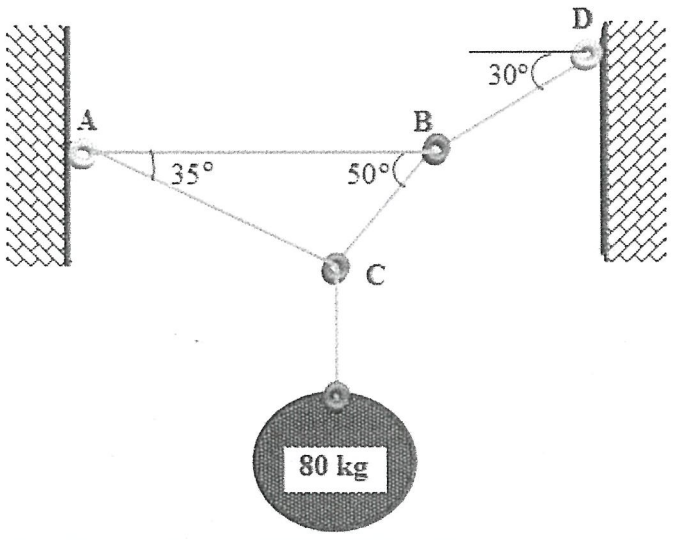


Figure Q2(b)

FINAL EXAMINATION

SEMESTER / SESSION	: SEM I / 2018/2019	PROGRAMME	: DAM
COURSE NAME	: STATICS	COURSE CODE	: DAM 10103

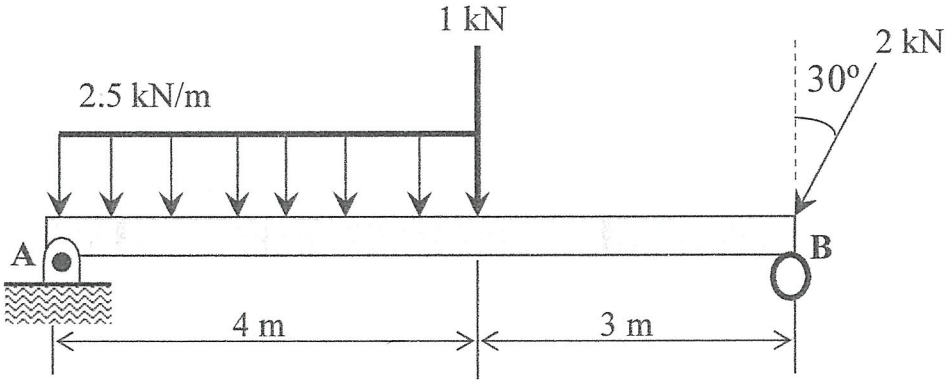


Figure Q3(b)

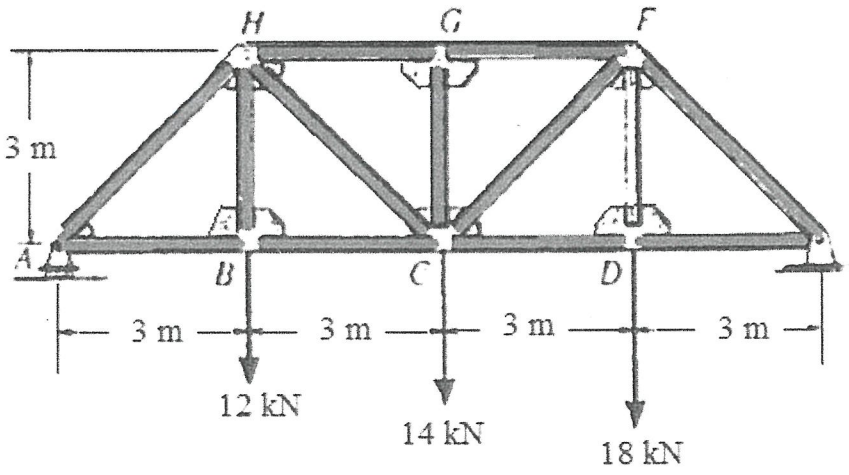


Figure Q4(b)

FINAL EXAMINATION

SEMESTER / SESSION	: SEM I / 2018/2019	PROGRAMME	: DAM
COURSE NAME	: STATICS	COURSE CODE	: DAM 10103

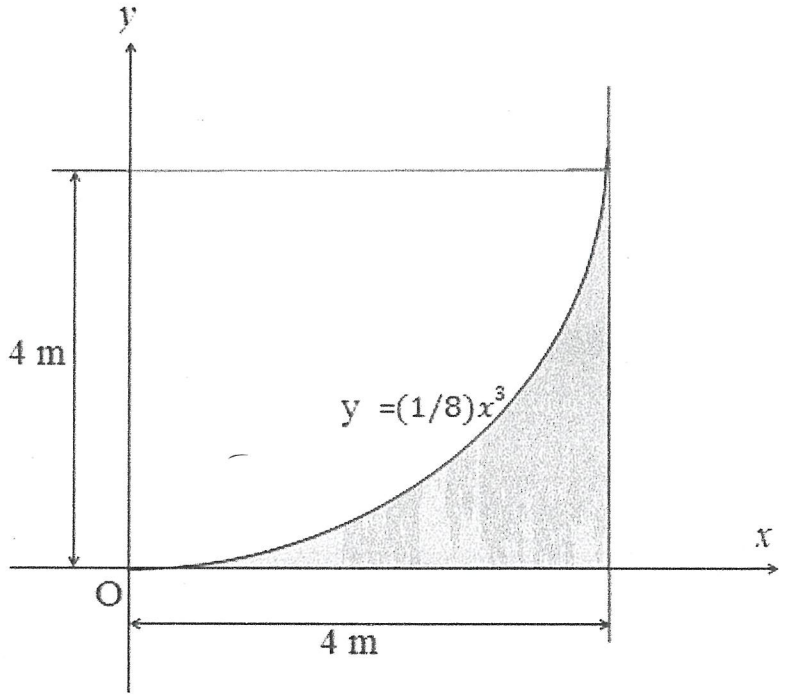


Figure Q5(c)

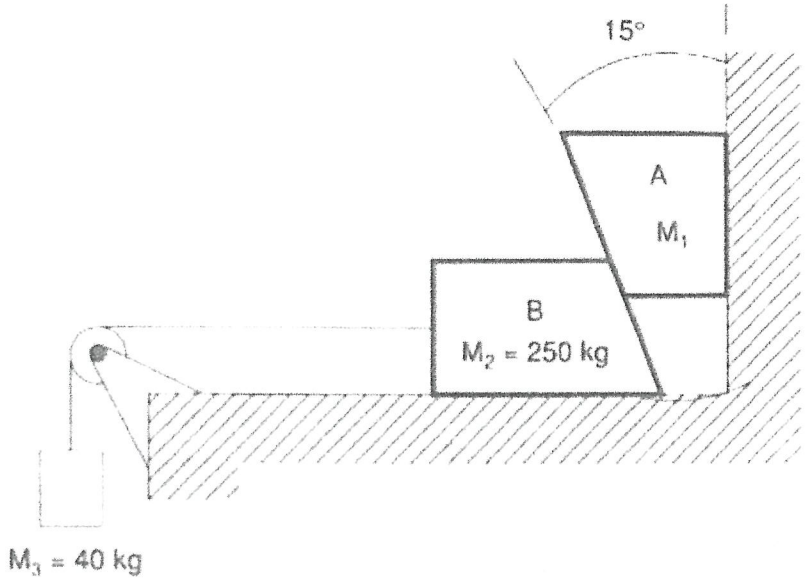


Figure Q6(b)

FINAL EXAMINATION

SEMESTER / SESSION	: SEM I / 2018/2019	PROGRAMME	: DAM
COURSE NAME	: STATICS	COURSE CODE	: DAM 10103

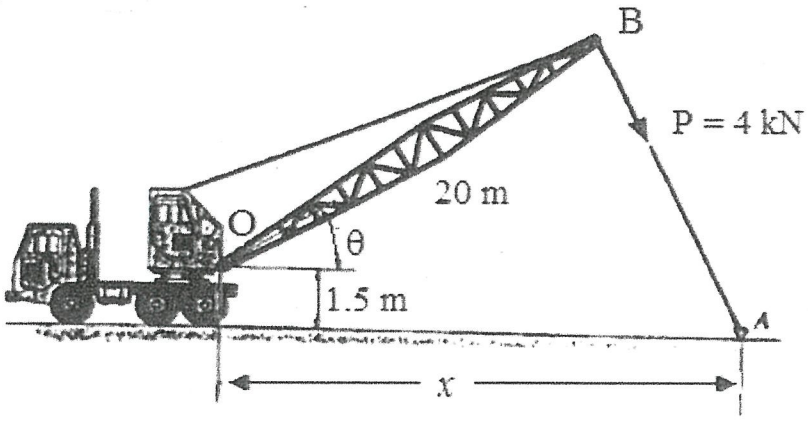


Figure Q7(a)

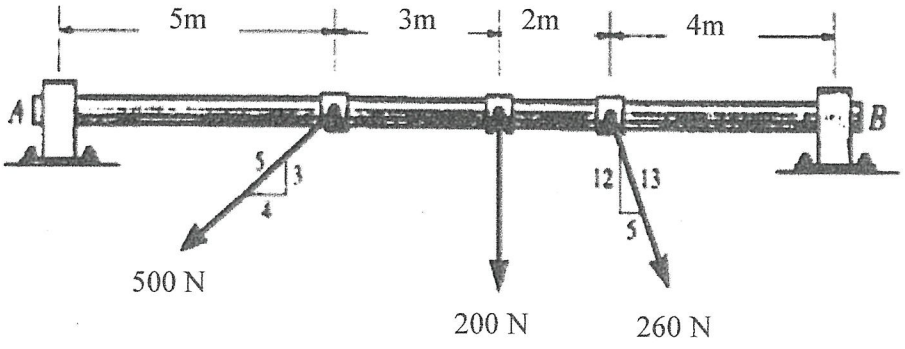


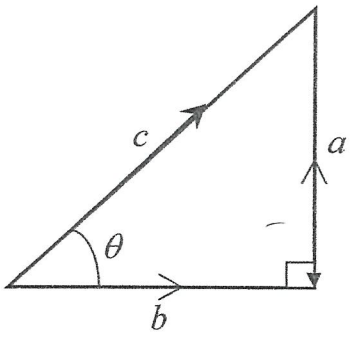
Figure Q7(b)

FINAL EXAMINATION

SEMESTER / SESSION	: SEM I / 2018/2019	PROGRAMME	: DAM
COURSE NAME	: STATICS	COURSE CODE	: DAM 10103

FORMULA:

1. Trigonometry



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

$$\cos\theta = \frac{b}{c} \qquad \operatorname{cosec}\theta = \frac{c}{a} = \frac{1}{\sin\theta}$$

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

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

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