UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER I
SESSION 2020/2021

COURSE NAME	:	STATIC AND DYNAMIC
COURSE CODE	:	BFC10103
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JANUARY 2021 / FEBRUARY 2021
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) Define the following terms below

(i) Couple

(2 marks)

(ii) Couple moment

(2 marks)

(b) The couple moment is also known as a free vector and is presented by the expression $M = r \times F$.

(i) Derive with illustration for the couple moment, M.

(3 marks)

(ii) Explain briefly the term of free vector.

(3 marks)

(c) A reinforced concrete slab of size 7.0 m x 7.0 m is subjected to a five column loading system as shown in **Figure Q1**. The resultant force, F_R is expected to act at the centre of the slab. Determine the forces F_A and F_B and magnitude of the resultant force, F_R

(15 marks)

Q2 (a) Draw the free body diagram of **Figure Q2(a)(i) to (iii)**

(6 marks)

(b) Two blocks in **Figure Q2(b)** are accelerated by pushing on the bottom block with a force F. The top block moves along with the bottom block. State the force that causes the top block to accelerate?

(2 marks)

(c) An overhanging roof shown in **Figure Q2(c)** for an outdoor cafe is consists of a 5 m long beam with mass 100 kg. Calculate where to attach the cable T so that the tension in the cable and the reaction force at the pin are the smallest if L(m) = 0.5, 1.0, 2.0, 3.0, 4.0 and 5.0.

(17 marks)

Q3 (a) Explain the importantant of friction in our life.

(3 marks)

(b) Determine the centroid of composite area as shown in **Figure Q3**.

(11 marks)

(c) Calculate the moment of inertia of the composite area.

(11 marks)

Q4 (a) An overhead crane is connected to a frictionless motor pulley as shown in **Figure Q4**. The crane will lift 4 brick pallets from ground level to a lorry. A pallet consists of 720 bricks with 2.2 kg per brick. Calculate the total lifting time require to vertically lift 4 pallets from ground to the top tip of the lorry's container.

(8 marks)

(b) A collision of a 2000 kg car (A) and a 1850 kg car (B) has remained both cars together due to the oil spill on the road. Car A was travelling at 80 km/h to the North and car B was travelling to the West at 1100 km/h, at the time of impact. Determine the resultant velocity and direction of both cars at the final momentum.

(7 marks)

(c) A low rise building is subjected to an excessive strong motion of ground acceleration up to 0.0001 g. The characteristic of dead weight of this building is 9810 kN. By using your own words with aided by sketches and calculations, describe the potential of structural failure by taking the specific Newton's Law principle into your explanation.

Given:
(i) $1\ g = 9.81\ m/s^2$.
(ii) The allowable notional horizontal load is restricted to be less than 1.5% from haft of the building's characteristic dead weight

(10 marks)

- END OF QUESTIONS –

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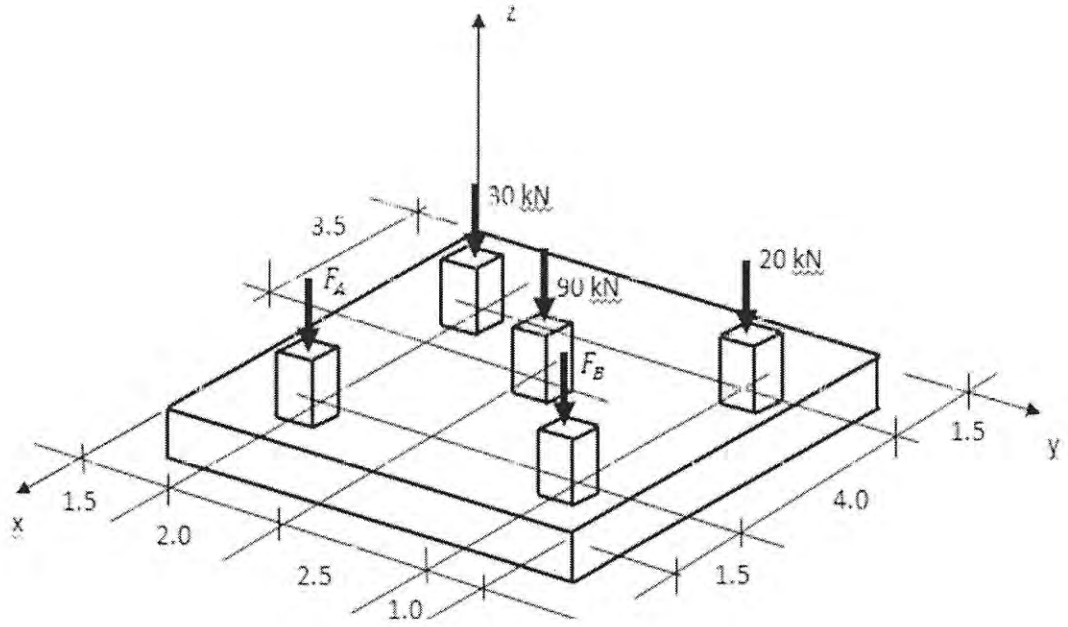

FIGURE Q1

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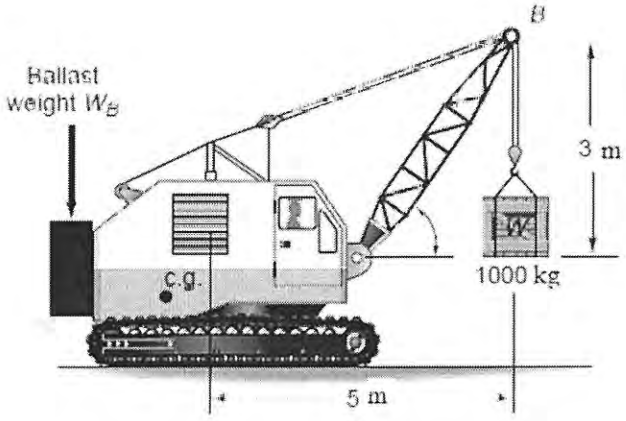
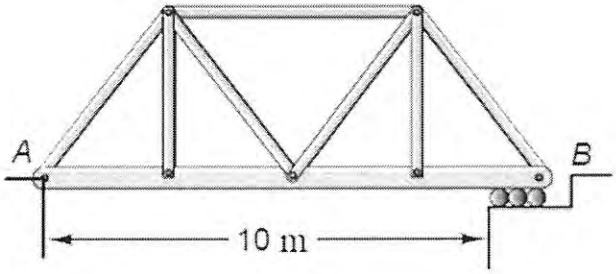


(i)



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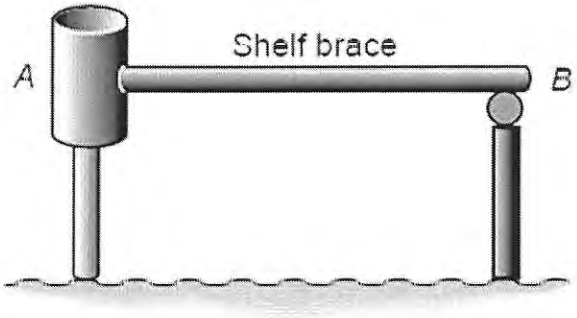

(iii)

FIGURE Q2(a)

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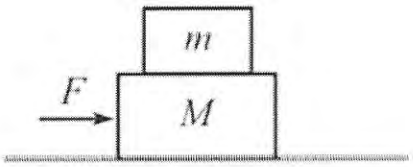

FIGURE Q2(b)

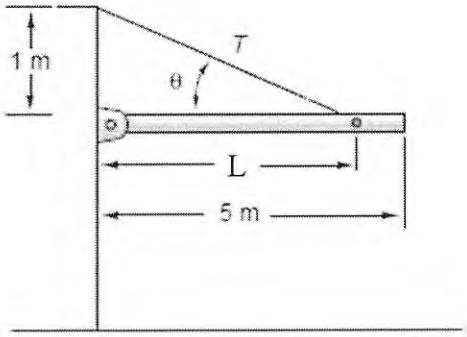

FIGURE Q2(c)

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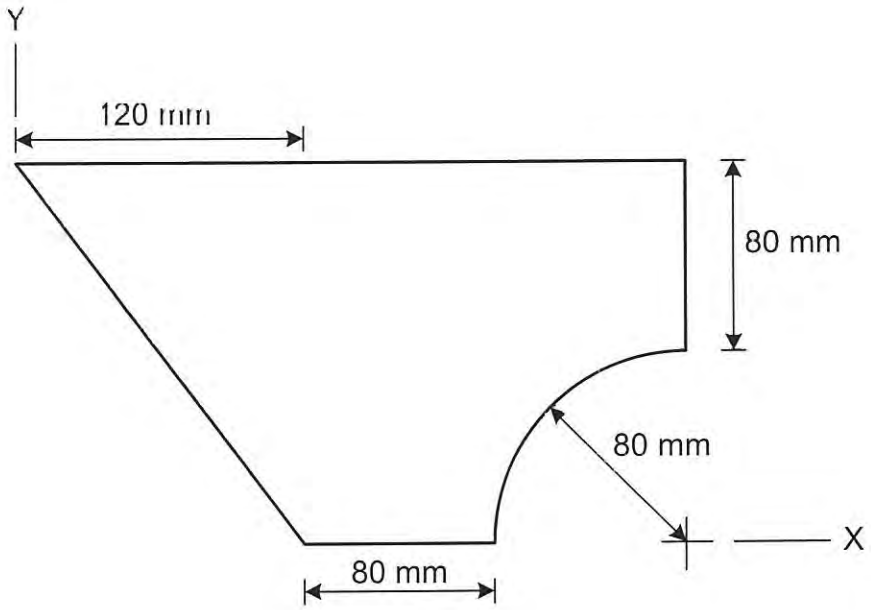

FIGURE Q3

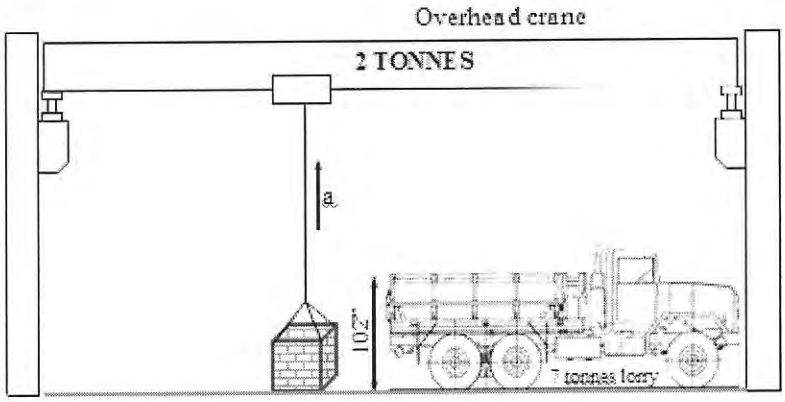

FIGURE Q4