Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019

COURSE NAME	:	STATIC AND DYNAMIC
COURSE CODE	:	BFC10103
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JUNE / JULY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS IN **PART A** AND **THREE (3)** QUESTIONS IN **PART B** .

THIS QUESTION PAPER CONSISTS OF **NINE (9)** PAGES

PART A

Q1 (a) Briefly explain **THREE (3)** types of motion in kinematic.

(6 marks)

(b) **Figure Q1** shows a man with 75 kg of mass inside an elevator. He decides to move from ground level to fifth floor which is 24 m at height. The elevator is capable to accelerate up to $0.2 m/s^2$ and decelerate to $0.1 m/s^2$ at maximum speed of 5m/s.

(i) Calculate the displacement and maximum velocity at the fifth floor.

(8 marks)

(ii) Determine the fastest time to arrive at the fifth floor.

(4 marks)

(iii) If the elevator is able to decelerate up to 3 m/s^2 from rest, calculate the work done based on his weight and the work of the normal force exert on him when the elevator descends 5 m.

(7 marks)

PART B

Q2 (a) Explain the principle of Newton Laws.

(5 marks)

(b) Convert all units below.

(i) 158 kN/mm^2 = _____ MPa

(ii) 130 kg/m^3 = _____ g/cm^3

(iii) 55 lb/in = _____ N/mm

(iv) 600 ft/s^2 = _____ m/s^2

(v) 73 N/mm^2 = _____ kN/m^2

(5 marks)

(c) By referring to **Figure Q2**, determine the magnitude of force, F, and its direction, θ_f, if the resultant force, R is 700N.

(15 marks)

Q3 (a) Give the definition of couple action in civil engineering and explain the effect of couple action.

(5 marks)

(b) Determine the magnitude and the resultant of couple moments acting on the rectangular plate as shown in **Figure Q3.**

(20 marks)

Q4 (a) Explain the definition of friction?

(2 marks)

(b A 400 gram package lying on a horizontal surface is attached to a horizontal string which passes over a smooth pulley as shown in **Figure Q4(a).** When a mass of 200 gram is attached to the other end of the string, the package is on the point of moving.

(i) Draw a free body diagram to show the forces acting on the box.

(3 marks)

(ii) Determine the coefficient of friction, μ.

(7 marks)

(c) A 100 lb force is pulling a 200 lb block as shown in **Figure Q4(b).** The coefficient of static friction between the block and the floor is $\mu_s = 0.6$ and the coefficient of kinetic is $\mu_k = 0.4$.

(i) Calculate the friction force between block and floor.

(9 marks)

(ii) Identify whether the block will move or not.

(4 marks)

Q5 **Figure Q5** shows the cross section of a culvert with the hole diameter of 10 m.

(a) Determine the height, H, of the culvert.

(2 marks)

(b) Determine the centroid of the culvert.

(9 marks)

(c) Find the location of the centroid.

(2 marks)

(d) Calculate the moment of inertia of the culvert.

(12 marks)

- END OF QUESTIONS –

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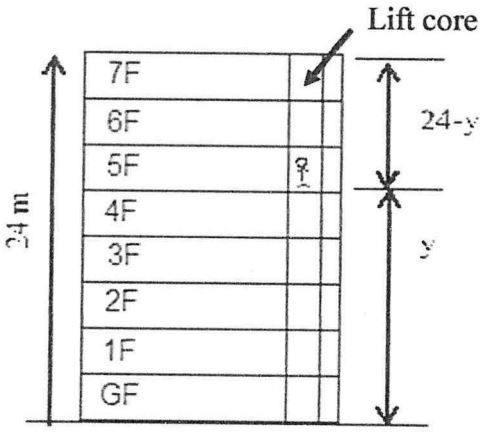

FIGURE Q1

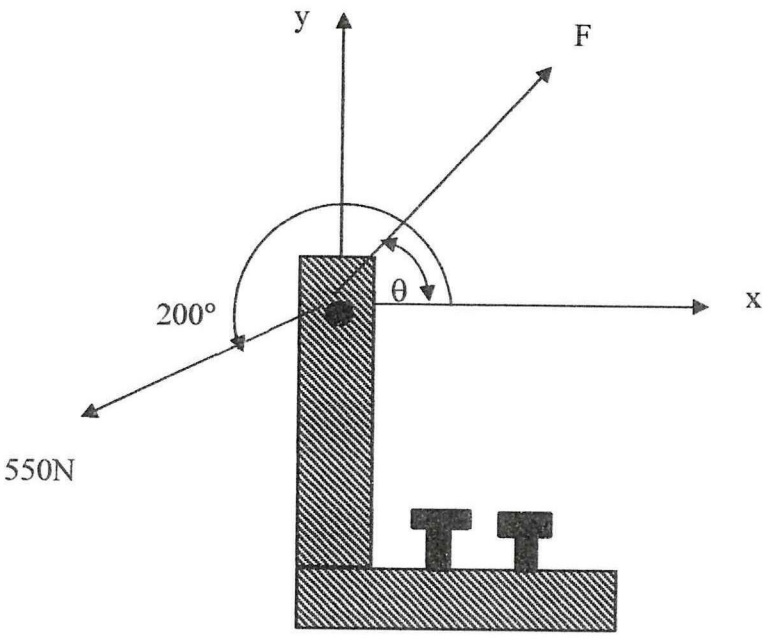

FIGURE Q2

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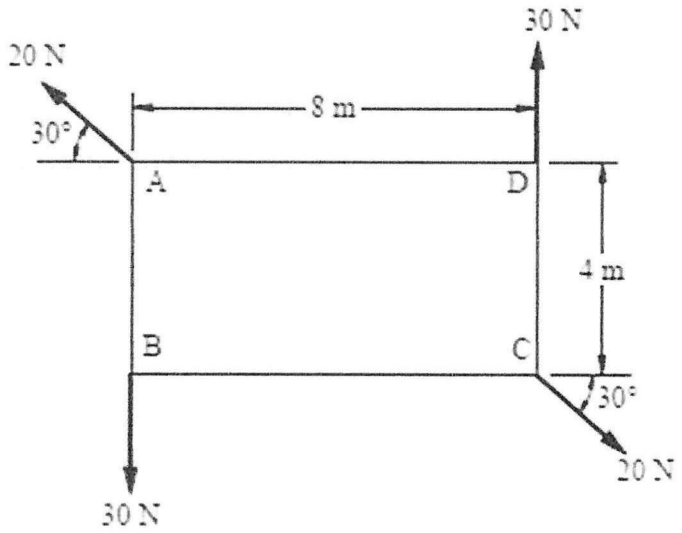

FIGURE Q3

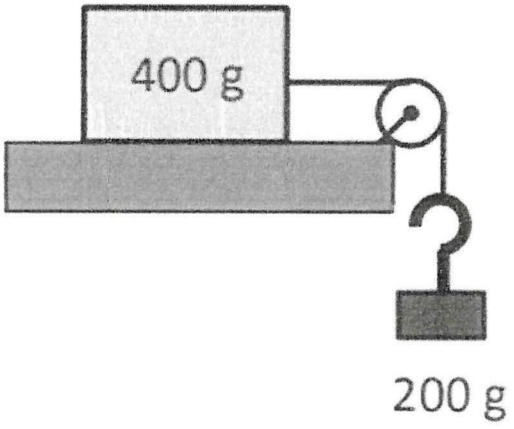

FIGURE Q4(a)

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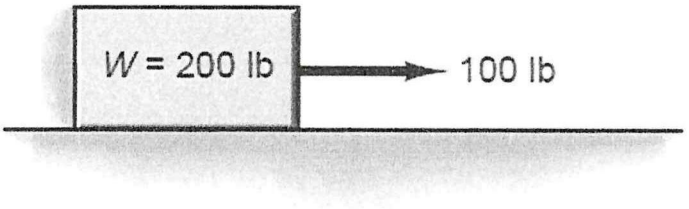

FIGURE Q4(b)

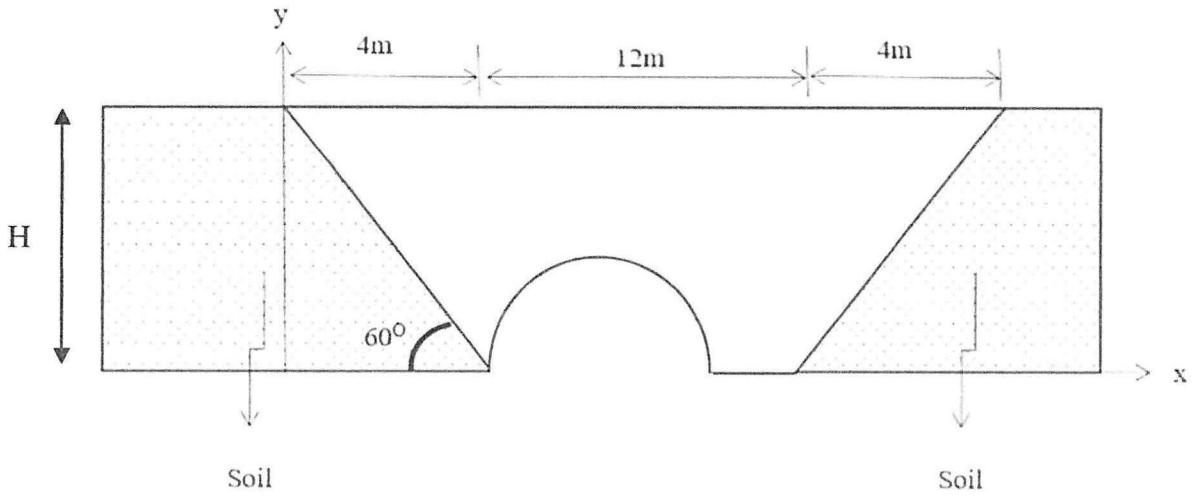

FIGURE Q5

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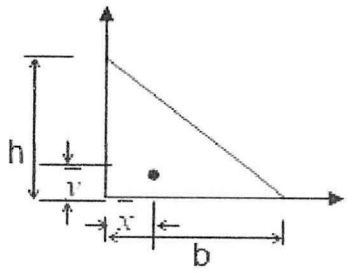
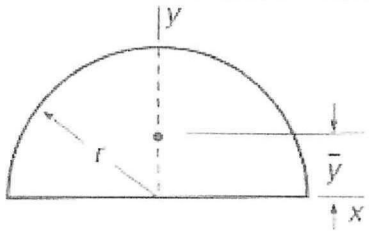
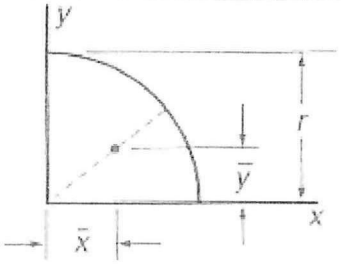
Centroid

	Shape	$\bar{x}$	$\bar{y}$	A
Triangle		$\frac{b}{3}$	$\frac{h}{3}$	$\frac{1}{2}bh$
Semicircle		0	$\frac{4r}{3\pi}$	$\frac{\pi r^2}{2}$
Quarter circle		$\frac{4r}{3\pi}$	$\frac{4r}{3\pi}$	$\frac{\pi r^2}{4}$

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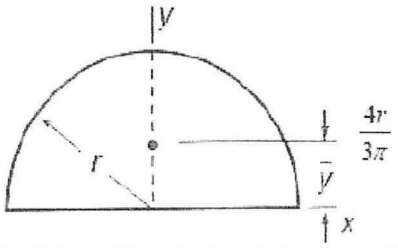
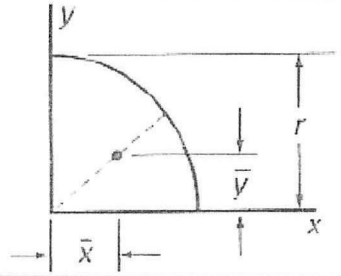
Moment of Inertia

Semicircle		$I_x = I_y = \frac{1}{8}\pi r^4$ $J = \frac{1}{4}\pi r^4$
Quarter circle		$I_x = I_y = \frac{1}{16}\pi r^4$ $J = \frac{1}{8}\pi r^4$

List of Equation

$$s = v_0 + \frac{1}{2}at^2$$

$$v = v_0 + at$$

$$v^2 = v_0^{\ 2} + 2as$$

$$F = ma$$

$$U = F.\,s$$