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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FMB11103**
SUBJECT TITLE	:	**STATICS AND DYNAMICS**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**3.30 PM - 6.00 PM (2.5 HOURS)**
DATE	:	**6 JANUARY 2015**

INSTRUCTIONS TO CANDIDATES

1. **Please read the instructions given in the question paper CAREFULLY.**
2. **This question paper is printed on both sides of the paper.**
3. **Please write your answers on the answer booklet provided.**
4. **Answer should be written in blue or black ink except for sketching, graphic and illustration.**
5. **This question paper consists of 5 questions. Answer any FOUR (4) questions.**
6. **Answer all questions in English.**

THERE ARE 4 PAGES OF QUESTIONS, EXCLUDING THIS COVER PAGE.

INSTRUCTIONS: Answer FOUR (4) questions ONLY.

Please use the answer booklet provided.

Question 1

(a) A 50 kg block rests on a 20º incline plane, as shown in Figure 1. The coefficient of static friction between the block and the plane is 0.4. Determine the maximum horizontal force P that can be applied to the block without causing it to slide.

(10 marks)

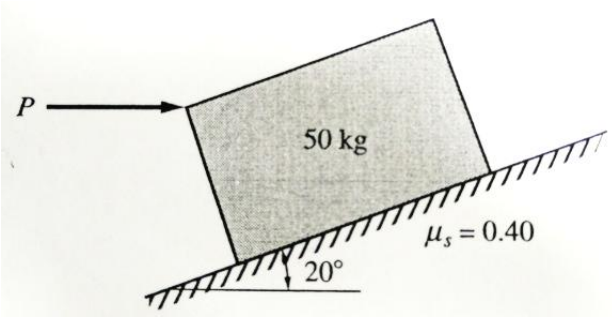

Figure 1

(b) The winch on the truck as shown in Figure 2 is used to hoist the garbage bin onto the bed of the truck. If the loaded bin has weight 37.81 kN and centre of gravity at *G*, determine the force in the cable needed to begin the lift. The coefficients of static friction at *A* and *B* are μA and μ*B* respectively. Neglect the height of the support at *A*. Given: $\mu A = 0.3$, $\mu B = 0.2$, a = 3048 mm, b = 9144 mm and $\theta = 30$ deg. (*Hint*: find moment at point B).

(15 marks)

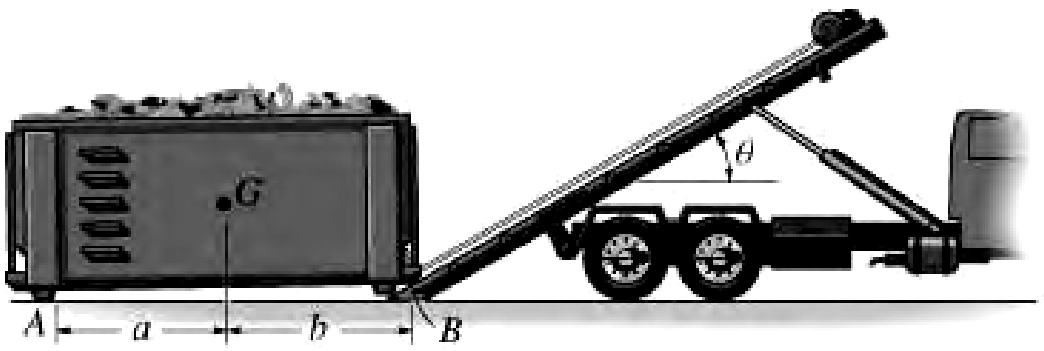

Figure 2

Question 2

The engine of mass *M* is suspended from a vertical chain at *A*. A second chain is wrapped around the engine and held in position by the spreader bar *BC*. Determine the compressive force acting along the axis of the bar and the tension forces in segments *BA* and *CA* of the chain. *Hint:* Analyze equilibrium first at *A*, then at *B*. (Figure 3)

(25 marks)

Given:

M = 200 kg

θ_1 = 55 deg

g= 9.81 m/s^2

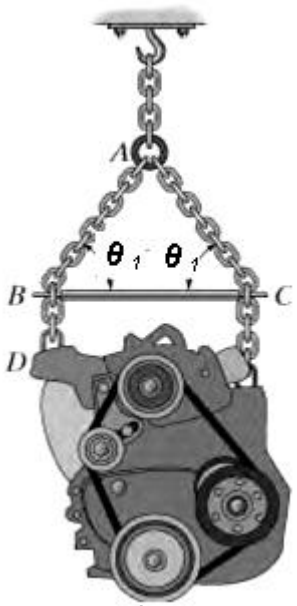

Figure 3

Question 3

a) Two boys push on the gate as shown in Figure 4. If the boy at B exerts a force F_B = 30 lb, determine the magnitude of the force F_A the boy at A must exert in order to prevent the gate from turning. Neglect the thickness of the gate.

(6 marks)

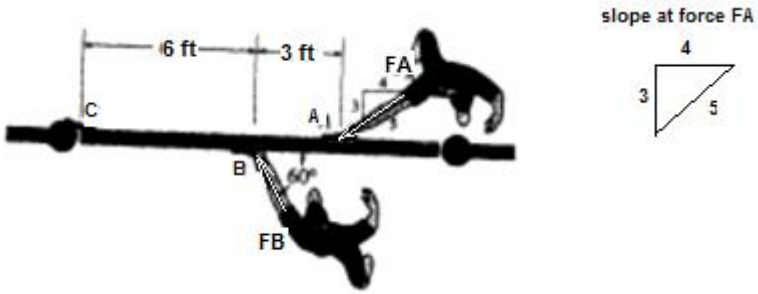

Figure 4

b) The boom in Figure 5 has length L, weight W_b and mass center at G. if the maximum moment that can be developed by the monitor at A is M. determine the maximum load W, having a mass center at G' that can be lifted. Given: L = 30 ft, W_b = 800 lb, a = 14 ft, b = 2 ft, θ = 30°, M = 20 x 10^3 lb.ft

(10 marks)

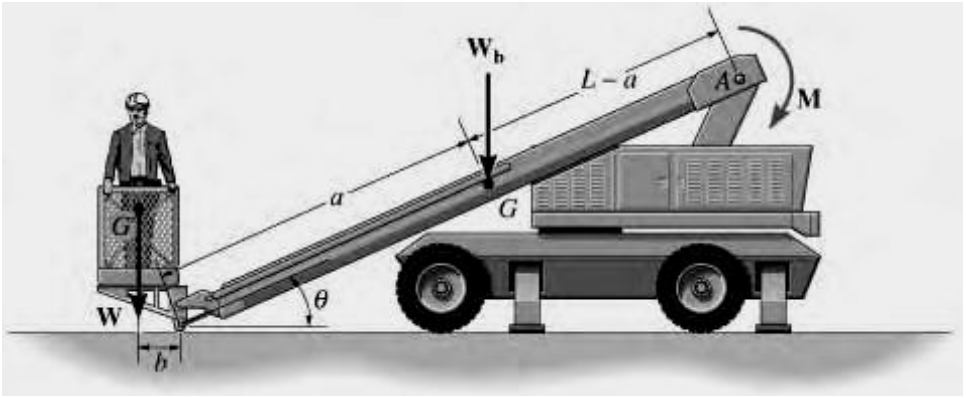

Figure 5

c) Determine the magnitude of the force F that should be applied at the end of the lever such in Figure 6 that this force creates a clockwise moment M about point O.

Given: M = 15 Nm, θ = 30°, ø = 60°, a = 50 mm, b = 300 mm

(9 marks)

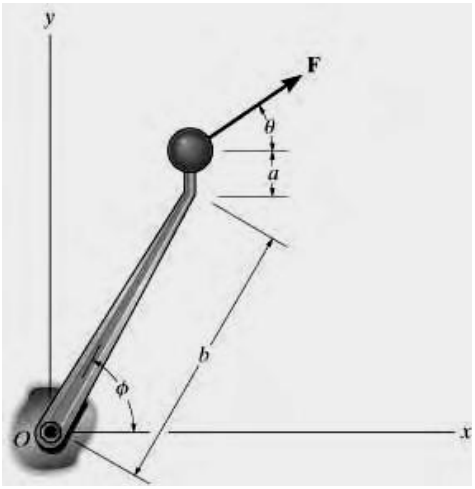

Figure 6

Question 4

(a) Explain the term linear motion using a simple example.

(5 marks)

(b) A stone *A* is dropped from rest down a well, and at time t_1 another stone *B* is dropped from rest. Determine the distance between the stones at a later time t_2 given that d = 24 m, t_1 = 1 s and t_2 = 2 s.

(10 marks)

(c) Describe Newton's 2nd Law of Motion using a simple numerical example.

(10 marks)

Question 5

(a) The angular velocity of the disk of radius 0.8 m is defined by $\omega = 5t^2 + 2$. Determine the magnitudes of the velocity and acceleration of point *A* that is measured at 120 degrees from the disk center disk when t = 0.5 s.

(10 marks)

(b) A car has a mass *M* and accelerates along a horizontal straight road from rest such that the power is always a constant amount *P*. Determine how far it must travel to reach a speed of *v*.

(7 marks)

(c) Define and explain the following terms :- conservation of energy principle and power.

(8 marks)

END OF QUESTION