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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2014 SESSION

SUBJECT CODE	:	**FMB 11103**
SUBJECT TITLE	:	**STATICS AND DYNAMICS**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**2.5 HOURS** **3.00 pm - 5.30 pm**
DATE	:	06 JUN 2014

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 TWO (2) sections. Section A and B. Answer all questions in Section A. For Section B, answer THREE (3) questions only.**
6. **Answer all questions in English.**

THERE ARE 5 PAGES OF QUESTIONS EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

Determine the magnitude of the resultant force $F_R = F_1 + F_2 + F_3$ and its directioon, measured counterclockwise from the positive x – axis referring to Figure 1.

(15 marks)

Given:

F_1 = 600 N

F_2 = 800 N

F_3 = 450 N

α = 45 deg

β = 60 deg

γ = 75 deg

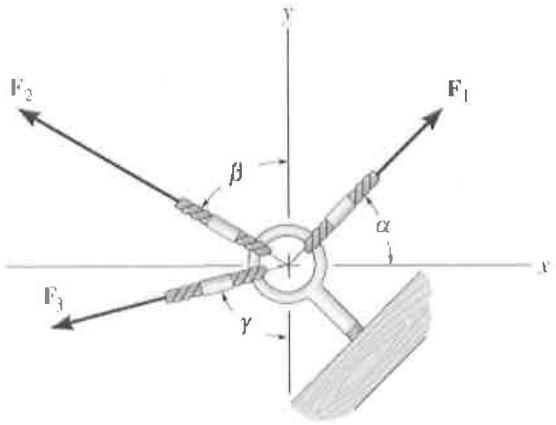

Figure 1

Question 2

The winch on the truck is used to hoist the garbage bin onto the bed of the truck as shown in Figure 2. If the loaded bin has weight W and center 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 μ_A and μ_B respectively. Neglect the height of the support at A.

(15 marks)

Given:

W = 40 kN

μ_A = 0.3

μ_B = 0.2

a = 10 m

b = 12 m

θ = 30 deg

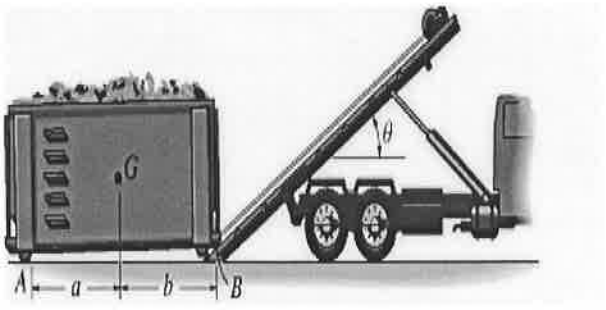

Figure 2

Question 3

An engineer must design a runway to accommodate airplanes that must reach a ground velocity of 75 m/s before they can take off. These planes are capable of being accelerated uniformly at the rate of 3.5 m/s^2.

(a) Determine how long it will take the planes to reach takeoff speed

(5 marks)

(b) Calculate the minimum length of runway needed.

(5 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) questions only.
Please use the answer booklet provided.

Question 4

The crate of mass ***M*** is subjected to forces $\mathbf{F_1}$ and $\mathbf{F_2}$, as shown in Figure 3. If it is originally at rest, determine the distance it slides in order to attain a speed ***v***. The coefficient of kinetic friction between the crate and the surface is μ_k.

(20 marks)

Given:
M = 100 kg
F_1=800 N
F_2=1300 N
$\theta_1 = 45^0$
$\theta_1 = 30^0$
V_f= 10 m/s
μ_k = 0.2
g = 9.81 m/s^2

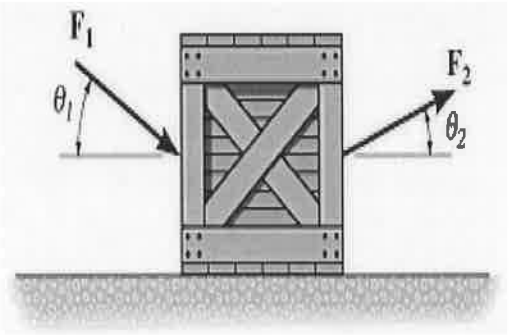

Figure 3

Question 5

Determine the tension in cables BC and BD referring to Figure 4 and the reactions at the ball and socket joint A for the mast.

(20 marks)

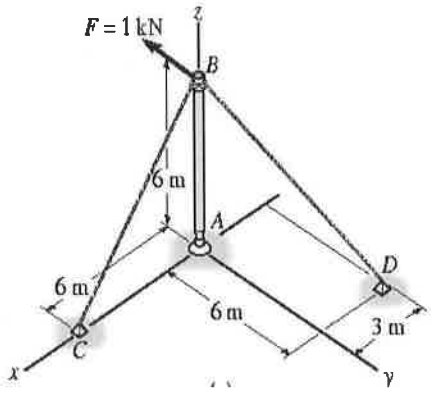

Figure 4

Question 6

Measurements of a shot recorded on a videotape during a basketball game are shown in Figure 5. The ball passed through the hoop even though it barely cleared the hands of the player *B* who attempted to block it. Neglecting the size of the ball, determine:

(a) time taken from A to C

(5 marks)

(b) the magnitude v_A of its initial velocity

(5 marks)

(c) time taken from A to B

(5 marks)

(d) height *h* of the ball when it passes over player *B*.

(5 marks)

Given:

$a = 1.8m$
$b = 13m$
$c = 2.5m$
$d = 3.5m$
$\theta = 30^0$
$g = 9.81 m/s$

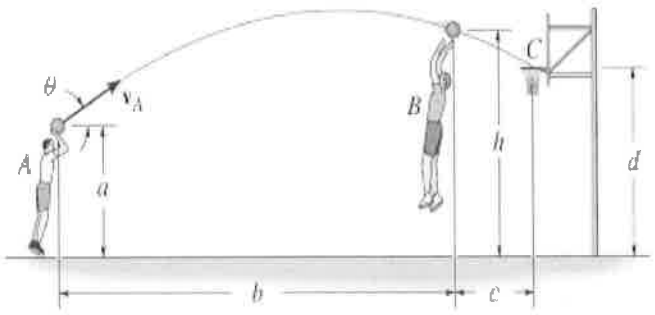

Figure 5

Question 7

(a) A large chunk of ice with mass 15 kg falls from a roof 8 meters above the ground shown in Figure 6. Determine the kinetic energy of the ice when it reaches the ground and then calculate the speed of the ice when it reaches the ground.

(10 marks)

Figure 6

(b) A bike rider approaches a hill with a speed of 6.5 m/s. The total mass of the bike and the rider is 75 kg. Determine the kinetic energy of the bike and rider as shown in Figure 7. If the rider coasts up the hill, calculate the height at which the bike will come to a stop. (Assume there is no friction.)

(10 marks)

Figure 7

END OF QUESTION