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CONFIDENTIAL

SET A

# UNIVERSITI KUALA LUMPUR

Malaysia France Institute

## FINAL EXAMINATION

## JANUARY 2014 SESSION

| | | |
|---|---|---|
| SUBJECT CODE | : | FMD 12103 |
| SUBJECT TITLE | : | STATICS AND DYNAMICS |
| LEVEL | : | DIPLOMA |
| TIME / DURATION | : | 2.5 HOURS 9.00 am - 11.30 am |
| DATE | : | 0 6 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 TWO (2) questions only.
6. Answer all questions in English.

THERE ARE 4 PRINTED PAGES OF QUESTIONS AND 1 PAGE OF FORMULA EXCLUDING THIS PAGE

## Section A : (60 marks)

**INSTRUCTION: Answer ALL questions.**
**Please use the answer booklet provided.**

### Question 1

Determine the magnitude of the resultant force $\mathbf{F_R = F_1 + F_2 + F_3}$ and its direction, measured counterclockwise from the positive *x* axis at the Figure 1.

(20 Marks)

**Given:**

$F_1 = 6kN$

$F_2 = 800N$

$F_3 = 450N$

$\alpha = 32^O$

$\beta = 55^O$

$\gamma = 70^O$

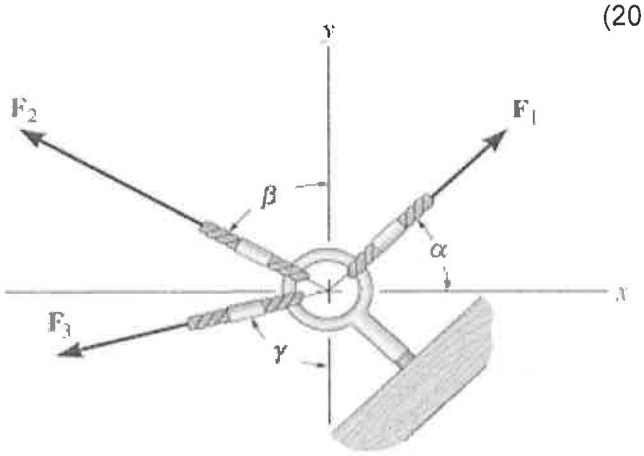


Figure 1

### Question 2

Determine the maximum mass of the engine that can be supported without exceeding a tension of **T1** in chain *AB* and **T2** in chain *AC* show in the Figure 2.

(20 Marks)

**Given:**

$\theta = 35^O$

T2 = 4.8kN

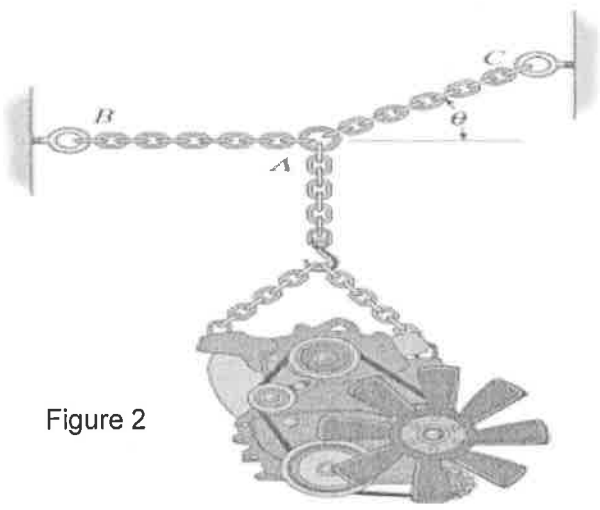


Figure 2

**Question 3**

In Figure 3, the rod on the power control mechanism for a business jet is subjected to force F. Determine the moment of this force about the bearing at *A*.

(20 Marks)

**Given:**

F = 80N

$\theta_1 = 20^O$

$\theta_2 = 60^O$

a = 150mm

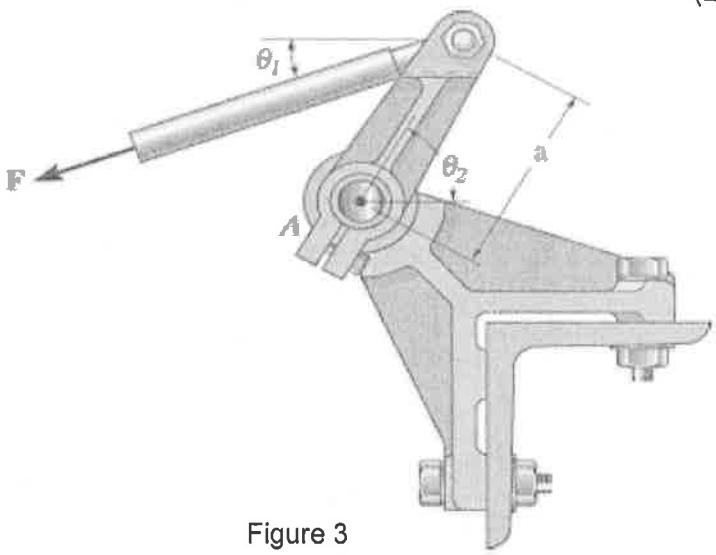


Figure 3

## Section B: (40 marks)

**INSTRUCTION: Answer TWO (2) questions ONLY.**
**Please use the answer booklet provided.**

### Question 4

The horizontal force is *P*; Determine the normal and frictional forces acting on the car of weight *W*. The friction coefficient is 0.43, refer to Figure 4.

(20 Marks)

**Given:**

M = 3000kg
$\theta = 25^{O}$
P = 5000N


Figure 4

### Question 5

a. A rocket traveling 100m/s accelerates at a rate of 4 $m/s^2$

i. Determine the speed of rocket after it has traveled 1 kilometers

(5 marks)

ii. Calculate time does it take to reach this speed

(5 marks)

b. An engineer must design a runway to accommodate airplane that must reach a ground velocity of 80 m/s before they can take off. These planes are capable of being accelerated uniformly at the rate of 5 m/s$^2$.

i. Determine how long it will take the planes to reach takeoff speed

(5 marks)

ii. Calculate the minimum length of runway

(5 marks)

**Question 6**

Determine the height *h* on the wall to which the firefighter can project water from the hose, if the angle θ is as specified and the speed of the water at the nozzle is $v_C$ refer to Figure 5.

(20 Marks)

**Given:**

$V_C$= 18 m/s

$h_1$ = 2m

d = 20m

θ = 30$^O$

g = 9.81 m/s$^2$

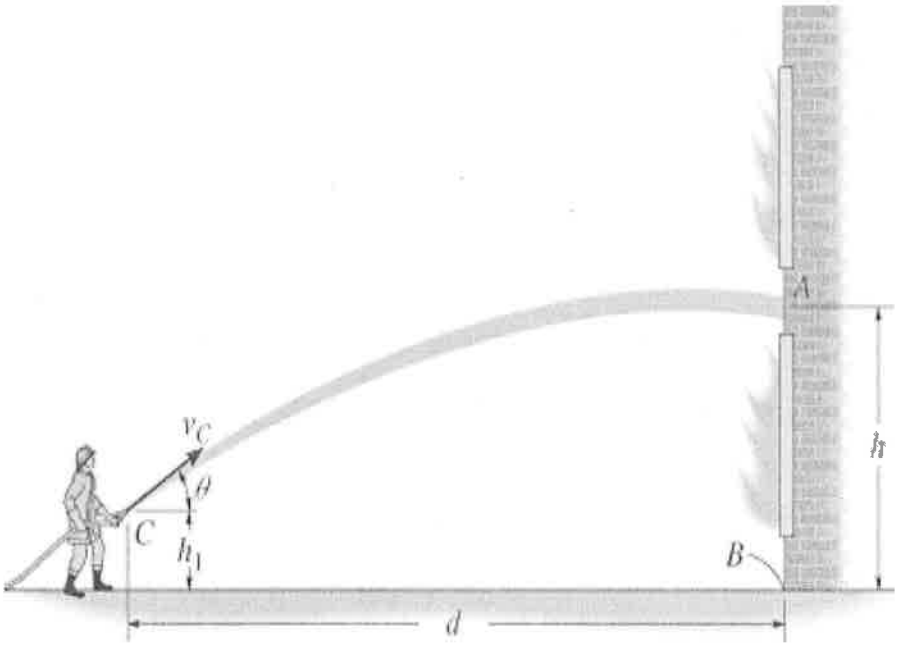


Figure 5

**END OF QUESTION**

**Formula:**

$F = mg$

$C^2 = A^2 + B^2 - 2AB\,Cos\theta$

$\frac{A}{Sin\,A} = \frac{B}{Sin\,B} = \frac{C}{Sin\,C}$

$\varepsilon Fx = 0 \rightarrow +ve$

$\varepsilon Fy = 0 \uparrow +ve$

$\varepsilon M = 0 \curvearrowright + ve$

$M = F\,x\,D$

$F_f = \mu\,x\,F_n$

$a = \frac{v - u}{t}$

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

$v^2 = u^2 + 2as$