



**UNIVERSITI KUALA LUMPUR  
Malaysia France Institute**

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**FINAL EXAMINATION  
SEPTEMBER 2013 SESSION**

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**SUBJECT CODE : FMB 11103**  
**SUBJECT TITLE : STATICS AND DYNAMICS**  
**LEVEL : BACHELOR**  
**TIME / DURATION : 2.5 HOURS**  
**DATE :**

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**INSTRUCTIONS TO CANDIDATES**

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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 6 questions. Answer **ALL** questions from Section A and **THREE (3)** questions from Section B.
6. Answer all questions in English.

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**THERE ARE 5 PAGES OF QUESTIONS WITH 1 PAGE OF APPENDIXES, EXCLUDING THIS PAGE.**

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**SECTION A (Total: 40 marks)**

**INSTRUCTION: Answer ALL the questions in this section.**

**Question 1**

- (a) (i) State the Newton's Second Laws of Motion and the difference between speed,  $v$ , and velocity,  $v$ .

(5 marks)

- (ii) Determine the volume of the cylinder shown in Figure 1 in  $\text{cm}^3$ .  
(Given  $1\text{in} = 25.4\text{mm}$ )

(5 marks)

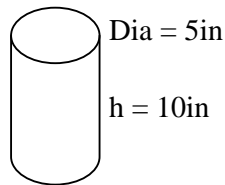


Figure 1

- (b) If the magnitude of the resultant force acting on the eyebolt in Figure 2 below is 700 N and its direction measured clockwise from the positive  $x$  axis is  $\theta = 35^\circ$ , determine the magnitude of  $F_1$  and the angle  $\phi$ .

(10 marks)

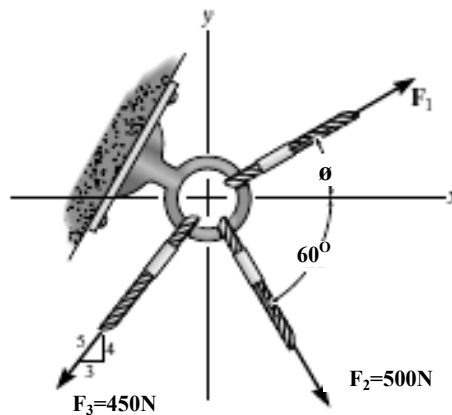


Figure 2

**Question 2**

- (a) A particle travels along a straight line to the right with a velocity of  $v = (4t - 3t^2)$  m/s where  $t$  is in seconds. Also,  $s = 0$  when  $t = 0$ . Determine the position and acceleration of the particle when  $t = 5$  s.

(12 marks)

- (b) A 50 kg object is dropped from a 40 m high building. Determine its velocity and kinetic energy when it is at 15 m level above the ground.

(8 marks)

**SECTION B (Total: 60 marks)**

**INSTRUCTION: Answer THREE (3) questions only.**

**Question 3**

The ends of the three cables are attached to a ring at *A* and to the edge of a uniform 250 kg plate as shown in Figure 3 below. Determine the tension in each of the cables for static equilibrium.

(20 marks)

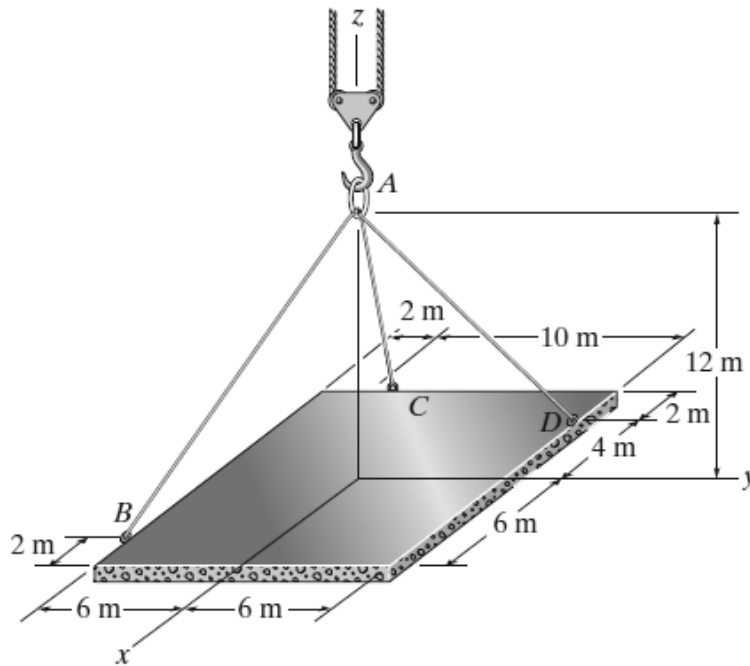


Figure 3

**Question 4**

Figure 4 below shows a man is trying to move a dresser cabinet with mass 50 kg that rest on horizontal floor. The coefficient of static friction between the dresser and the floor is  $\mu_s = 0.5$ , and the man's mass is 80 kg.

(a) Find the smallest magnitude of **F** needed to move the dresser if  $\theta = 30^\circ$ .  
(10 marks)

(b) Also determine the smallest coefficient of static friction between his shoes and the floor so that he does not slip.  
(10 marks)

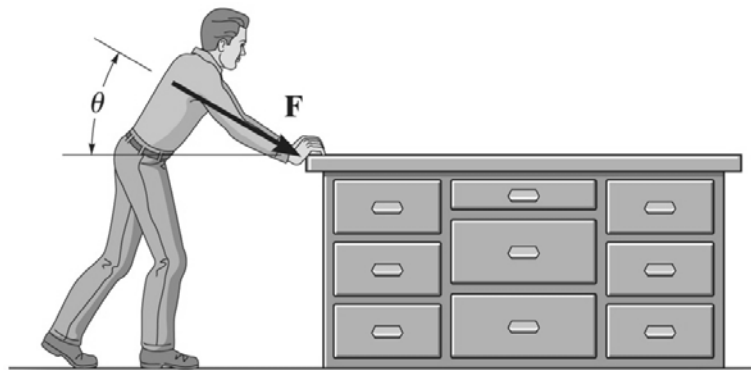


Figure 4

**Question 5**

When  $s = 0.6 \text{ m}$ , the spring in the Figure 5 below is not stretched or compressed, and the  $12\text{kg}$  block, which is subjected to a force of  $120 \text{ N}$ , has a speed of  $7 \text{ m/s}$  down the smooth plane. Determine the distance  $s$  when the block stops.

(20 marks)

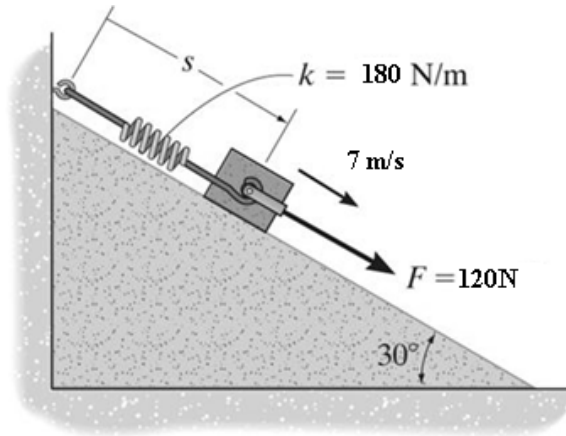


Figure 5

**Question 6**

A  $10000 \text{ kg}$  truck in Figure 6 below increases its speed uniformly from rest to  $20 \text{ km/h}$  in  $40 \text{ s}$ . The engine efficiency is  $0.8$  and the slope inclination  $\theta = 10^\circ$ . No slippage between the wheels and the slope surface.

a) Determine the maximum power and the average power supplied by the engine. (12 marks)

b) Determine the power supplied by the engine if the truck is to maintain a constant speed of  $15 \text{ km/h}$  up the slope. (8 marks)



Figure 6

**END OF QUESTION**

**Formulae**

$$\cos \alpha = \frac{A_x}{A} \quad \cos \beta = \frac{A_y}{A} \quad \cos \gamma = \frac{A_z}{A}$$

$$\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 1$$

$$\mathbf{F}_R = \sum \mathbf{F} = \sum F_x \mathbf{i} + \sum F_y \mathbf{j} + \sum F_z \mathbf{k}$$

$$\mu = \frac{F_f}{F_n}$$

$$v = v_0 + at$$

$$S = S_0 + v_0 t + (1/2) a_c t^2$$

$$v^2 = v_0^2 + 2a_c(S - S_0)$$

$$I = (mr^2)/2 \quad \text{for solid disc or shaft}$$

$$v = r\omega$$

$$P = Fv$$

$$P = T\omega$$

$$W = (kx^2)/2$$

$$KE = (mv^2)/2$$

$$Ft = mv$$