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CONFIDENTIAL

SET B

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAM
JULY 2010 SESSION

SUBJECT CODE	:	FMB 16203
SUBJECT TITLE	:	DYNAMICS
LEVEL	:	BACHELOR
TIME / DURATION	:	3.00pm – 5.30pm (2.5 HOURS)
DATE	:	19 NOVEMBER 2010

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 6 questions. Answer 2 questions from Section A and 3 question from Section B.
6. Answer all questions inEnglish.
7. Parts of the formulae are appended.

THERE ARE 4 PAGES OF QUESTIONS AND 1 PAGE OF APPENDIX, EXCLUDING THIS COVER PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer all the questions in this section.

Question 1

(a) State the Second Law of Newton's Laws of Motion.

(2 marks)

(b) Differentiate between speed, v, and velocity, $\boldsymbol{v}$, and state the SI unit of measure for these quantities.

(3 marks)

(c) The rocket has an acceleration described by the graph in Figure 1. If it starts from rest, construct the *v-t* and *s-t* graphs for the motion for the time interval $0 \leq t \leq 14$ s.

(15 marks)

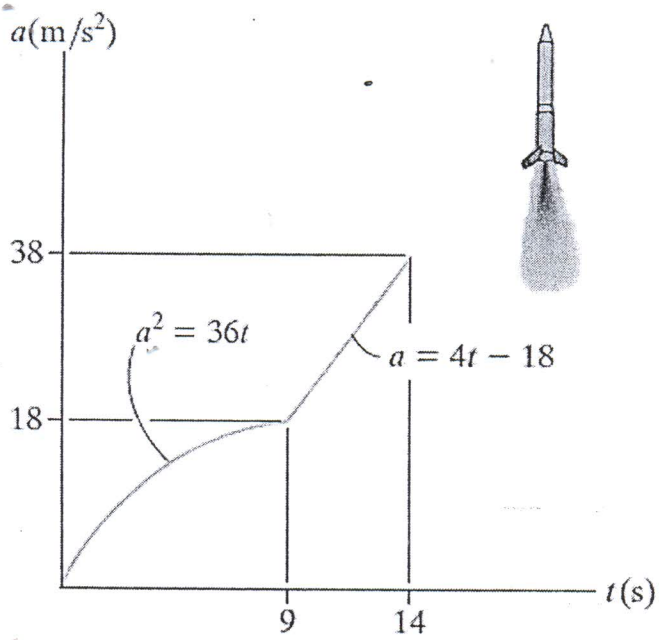

Figure 1

Question 2

(a) The skateboard rider in Figure 2 leaves the ramp at A with an initial velocity v_A at a 30° angle. If he strikes the ground at B, determine v_A and the time of flight.

(10 marks)

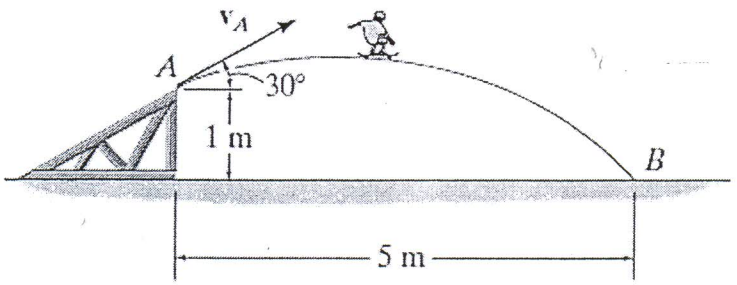

Figure 2

(b) At the instant shown in Figure 3, car A travels along the straight portion of the road with a speed of 25 m/s. At this same instant car B travels along the circular portion of the road with a speed of 15 m/s, determine the velocity of car B relative to car A.

(10 marks)

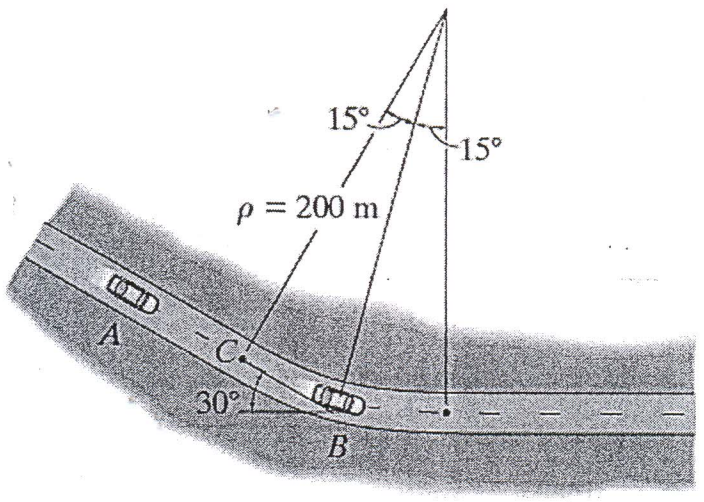

Figure 3

SECTION B (Total: 60 marks)

INSTRUCTION: Choose and Answer Three (3) questions only.

Question 3

Motor *M* in Figure 4 draws in the cable with an acceleration $a_{p/c}$ of 2 m/s^2, measured relative to the 120 kg mine car. Determine the acceleration of the car and the tension in the cable. Neglect the mass of the pulleys.

(20 marks)

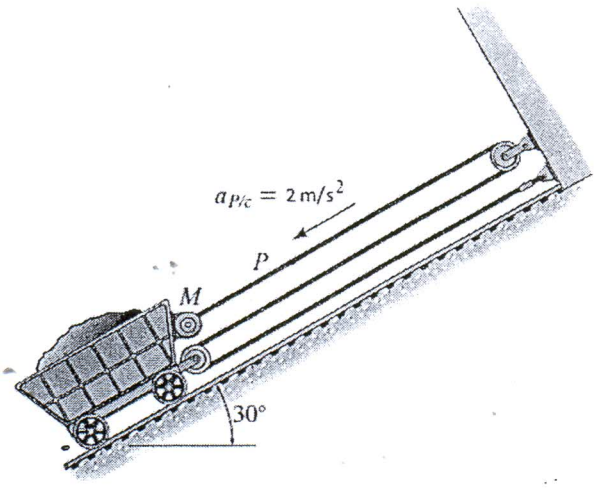

Figure 4

Question 4

The man at the window A *in* Figure 5 wishes to throw a sack of mass *M* = 30 kg onto the ground. To do this he allows it to swing from rest at *B* to point *C*, when he releases the cord at $\theta = 30°$. The length of the cord L = 8 m and initial height h =16 m; Determine the speed at which it strikes the ground and the distance *R*.

(20 marks)

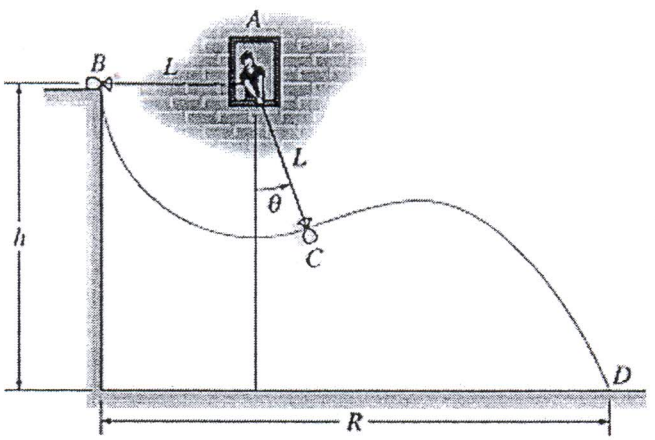

Figure 5

Question 5

The package of mass M = 5 kg is released from rest at A as shown in Figure 6 below. It slides down the smooth plane which is inclined at angle $\theta = 30^{\circ}$ onto the rough surface having a coefficient of kinetic friction of $\mu_k = 0.2$. Determine the total time of travel before the package stops sliding. Neglect the size of the package. Given : h = 3 m

(20 marks)

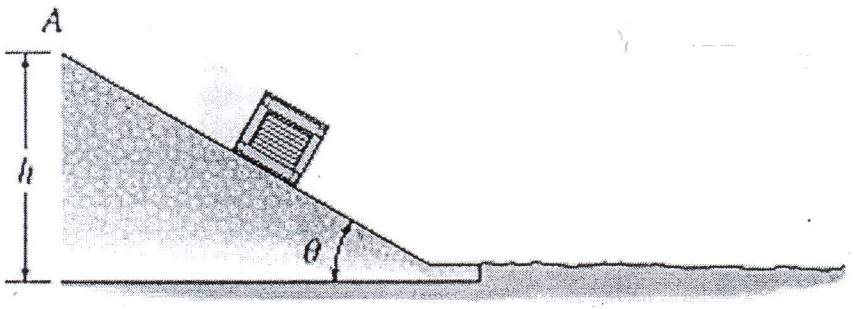

Figure 6

Question 6

The disk in Figure 7 below having weight W = 75 N, is pinned at its center O and supports the block A that has weight W_A = 15 N. If the belt which passes over the disk is not allowed to slip at its contacting surface, determine the natural period of vibration of the system. Given: k = 1500 N/m and r = 0.225 m.

(20 marks)

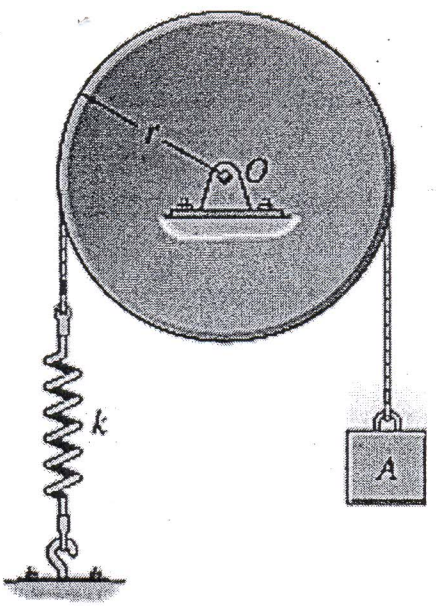

Figure 7

Appendix :

$y = f(x)$	$\frac{dy}{dx} = f'(x)$
$\ln x$	$\frac{1}{x}$
e^{ax}	ae^{ax}
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\sec x$	$\sec x \tan x$
$\operatorname{cosec} x$	$-\operatorname{cosec} x \cot x$
$\cot x$	$-\operatorname{cosec}^2 x$

$f(x)$	$\int f(x)\, dx$
x^n	$\frac{x^{n+1}}{n+1} + c$
$\frac{1}{x}$	$\ln\lvert x\rvert + c$
$\frac{f'(x)}{f(x)}$	$\ln\lvert f(x)\rvert + c$

$$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$$

$$\int \frac{d}{dx}(uv) = \int \left(u\frac{dv}{dx} + v\frac{du}{dx}\right)$$

$$uv = \int u\frac{dv}{dx} + \int v\frac{du}{dx}$$

$$\int u\frac{dv}{dx} = uv - \int v\frac{du}{dx}$$

$$\rho = \frac{[1 + (dy/dx)^2]^{3/2}}{\lvert d^2y/dx^2\rvert}$$

$$v_B = v_A + v_{B/A}$$

$$a_B = a_A + a_{B/A}$$

END OF QUESTION