UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY

FINAL EXAMINATION
SEPTEMBER 2016 SEMESTER

COURSE CODE	: LGB 21503
COURSE NAME	: APPLIED DYNAMICS
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	: BACHELOR OF ENGINEERING TECHNOLOGY(HONS) IN NAVAL ARCHITECTURE & SHIPBUILDING
DATE	: 19 JANUARY 2017
TIME	: 09.00 AM – 12.00 AM
DURATION	: 3 HOURS

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.
7. Formulae sheet has been appended for your reference.

THERE ARE 4 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

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

Question 1

The position coordinate of a particle which is confined to move a long a straight line given by $s = 4t^3 - 12t + 4$ where s is measured in meters from the convenience origin and t is in seconds. Determine;

(a) The times required for the particle to reach a velocity of 86 m/s

(8 marks)

(b) The acceleration of the particle when $V = 32$ m/s

(6 marks)

(c) The net displacement of the particle during the interval from $t = 1s$ to $t = 4s$

(6 marks)

Question 2

The flatbed truck as shown in Figure 1, carries an 80-kg crate, starts from rest and attains a speed of 72 km/hr in a distance of 75 m on a level road with constant acceleration. The friction force acting on the crate during this interval, if the $\mu_s = 0.3$ and $\mu_k = 0.28$, Determine;

(a) The work done by the friction force.

(12 marks)

(b) What is the distance to be stopped when the driver applied the brake immediately without the crate slip on the flat bed surface?

(8 marks)

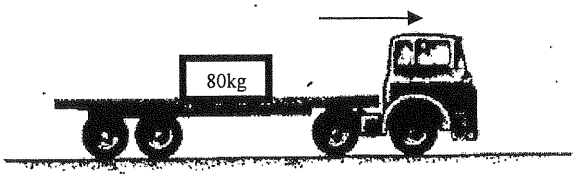

Figure 1

SECTION B (Total: 60 marks)

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

Question 3

The 6 kg cylindrical collar as shown in Figure 2 is released from rest in the position shown and drops onto the spring. Calculate the velocity, *v* of the cylinder when the spring has been compressed 50 mm.

(20 marks)

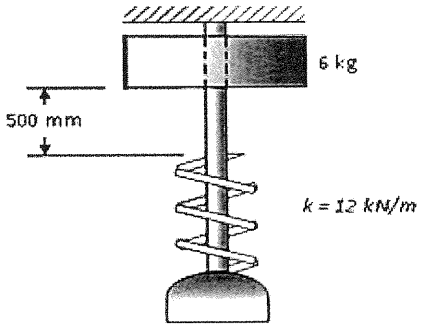

Figure 2

Question 4

A car as shown in Figure 3 is traveling at 60 km/h down a 10 percent grade when the brakes on all four wheels lock. If the kinetic coefficient of friction between the tires and the road is 0.70, find the distance *s* measured along the road which the car skids before coming to a stop.

(20 marks)

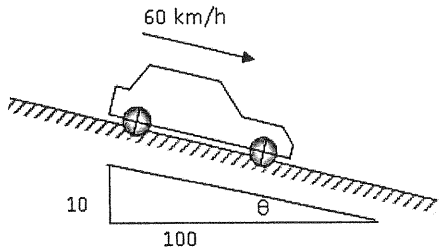

Figure 3

Question 5

The loaded 150kg skip as shown in Figure 4 is moving down the incline at 4 m/s when a force *P* is applied to the cable at time $t = 0$. The force *P* is increased uniformly with the time until it reaches 600 N at $t = 4$ s after which time it remains constant at this value.

(a) Sketch the F.B.D and plot the graph of force, P vs t (s) of the systems

(6 marks)

(b) The final time, t_1 at which the skip reverses its direction

(10 marks)

(c) The velocity *v* of the skip at $t = 8$ s. Treat the skip as a particle.

(4 marks)

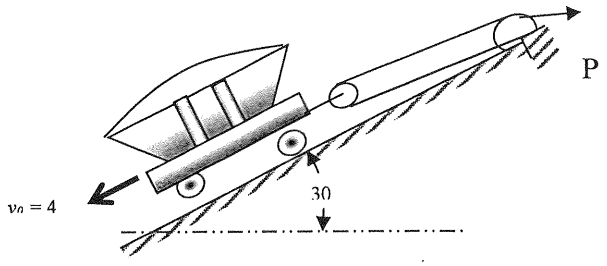

Figure 4

Question 6

The mass on two rotors in planes B and C has shown in Figure 6 are unbalanced weight for the shaft. Determine the masses to be added on the rotor in planes A and D at radius 50mm which will produce static and dynamics balance. Given the mass of B is 5.5kg and C is 2.5kg.

(20 marks)

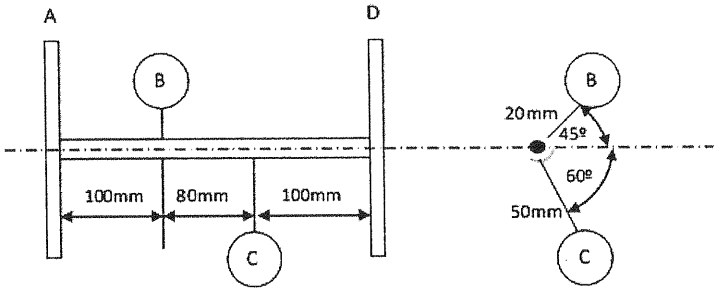

Figure 6

END OF EXAMINATION PAPER

Formulae in Dynamics Applications

1. Particle in Motion;

$2\,a\,s = \Delta v^2$

$v = r'\,u_r + r\,\emptyset' u_\emptyset$

$a = (r'' - r\emptyset'^2)\,a_r + (r\emptyset'' + 2r'\emptyset')\,a_\emptyset$

2. The force action at Block A;

$\sum F_A = m\,a_A;$

3. Total power, P = F.*v* ;

4. Conservation of Momentum;

the *n*- direction gives; $m_1(v_1)_n + m_2(v_2)_n = m_1(v_1')_n + m_2(v_2')_n$

the *t*-direction; $m_1(v_1)_t = m_1(v_1')_t$

The coefficient of restitution relationship; $e = \dfrac{(v_2')_n - (v_1')_n}{(v_1)_n - (v_2)_n}$

5. The kinetic energy; $T = \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2$

6. The potential energy; $V_e = \frac{1}{2}\,k\delta_x^2$; $V_g = mgh$

7. Conservation of Work & Energy; $T_1 + V_1 = T_2 + V_2$

8. Principle of Work & Energy; $T_1 + U_{1\text{-}2} = T_2$

Prepared by: ISA Sept.2013

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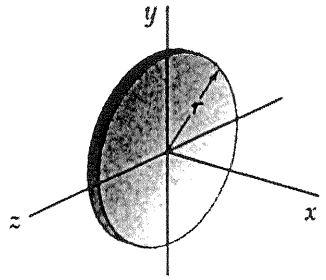
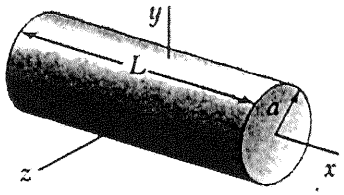
Moments of Inertia of Common Geometric Shapes



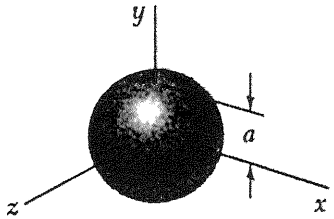
$I_x = \frac{1}{2} mr^2$

$I_y = I_z = \frac{1}{4} mr^2$

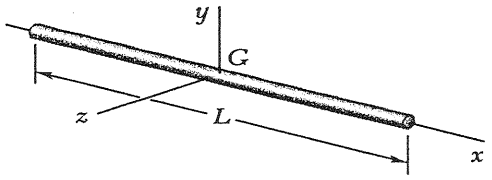


$I_x = \frac{1}{2} ma^2$

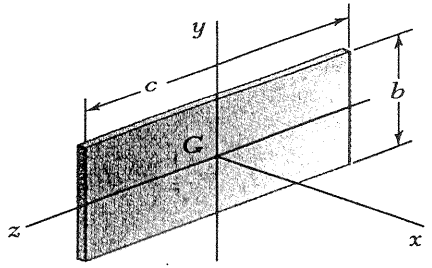
$I_y = I_z = \frac{1}{12} m(3a^2 + L^2)$



$I_x = I_y = I_z = \frac{2}{5} ma^2$



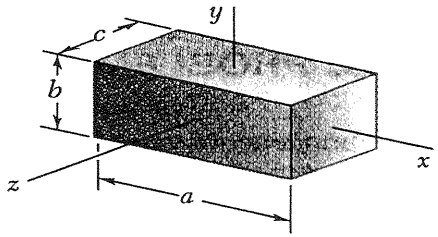
$I_y = I_z = \frac{1}{12} mL^2$



$I_x = \frac{1}{12} m(b^2 + c^2)$

$I_y = \frac{1}{12} mc^2$

$I_z = \frac{1}{12} mb^2$



$I_x = \frac{1}{12} m(b^2 + c^2)$

$I_y = \frac{1}{12} m(c^2 + a^2)$

$I_z = \frac{1}{12} m(a^2 + b^2)$