UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY

FINAL EXAMINATION
JANUARY 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	: 30 MAY 2016
TIME	: 08.00 AM – 11.00 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

A particle moves in a straight line with the accelerated shown in the Figure 1. This particle move from the origin point with v_o = -3.6m/s and t_o = 0.

(a) Plot the graph for v – t curves for 0 < t < 20s

(10 arks)

(b) Plot the graph for x – t curves for 0 < t < 12s

(8 marks)

(c) Determine its velocity and the distance travelled when t = 12s.

(2 marks)

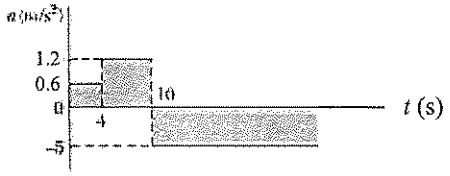


Figure 1

Question 2

A 20-kg package has shown in Figure 2 is at rest on an incline when a force P is applied to it. The static and kinetic coefficients of friction between the package and the incline are both equal to 0.3.

(a) Draw the Free Body Diagram (F.B.D) and Kinetic Diagram (K.D)

(4 marks)

(b) Determine the magnitude of P if 10 s is required for the package to travel 5 m up the incline. (16 marks)

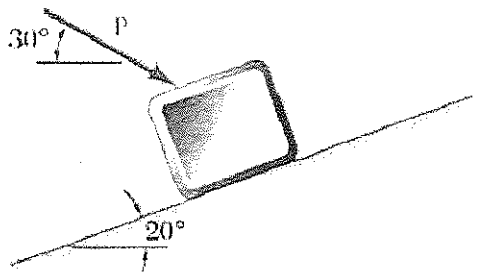


Figure 2

SECTION B (Total: 60 marks)

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

Question 3

A 10-kg collar slides without friction along a vertical rod has shown in Figure 3. The spring attached to the collar has an un-deformed length of 100mm and a spring constant of 600 N/m. If the collar is released from rest in position 1, determine its velocity after it has moved 150mm to position 2. (20 marks)

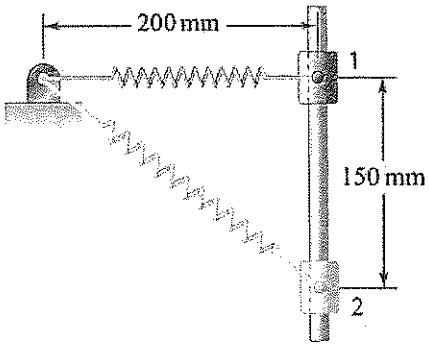


Figure 3

Question 4

The 50-g bullet travelling at 600 m/s strikes the 4-kg block centrally and is embedded within it has shown in Figure 4(a). If the block is sliding on a smooth horizontal plane with a velocity of 12 m/s in the direction shown in Figure 4(b) just before the impact,

(a) Determine the velocity *v* of the block and bullet combined after impact.

(16 → marks)

(b) Calculate its direction θ immediately after impact.

(4 marks)

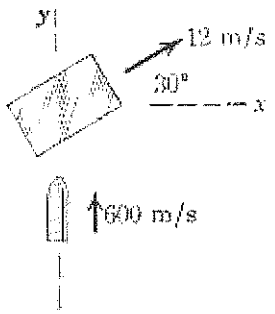


Figure 4 (a)

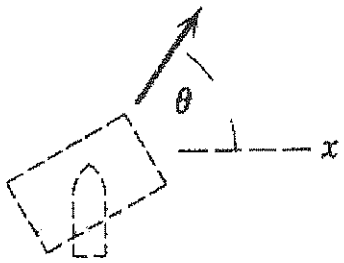


Figure 4 (b)

Question 5

The pinion A of the hoist motor drives gear B which is attached to the hoisting drum has shown in Figure 5. The load L is lifted from its rest position and acquires an upward velocity of 2 m/s in a vertical rise of 0.8 m with constant acceleration. As the load passes as at this position;

(a) Calculate the acceleration of point C on the cable in contact with the drum

(9 marks)

(b) Determine the angular velocity and angular acceleration of the pinion A

(11 marks)

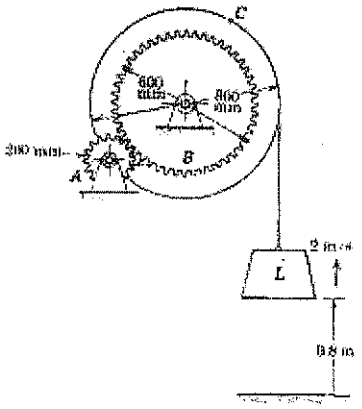


Figure 5

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)

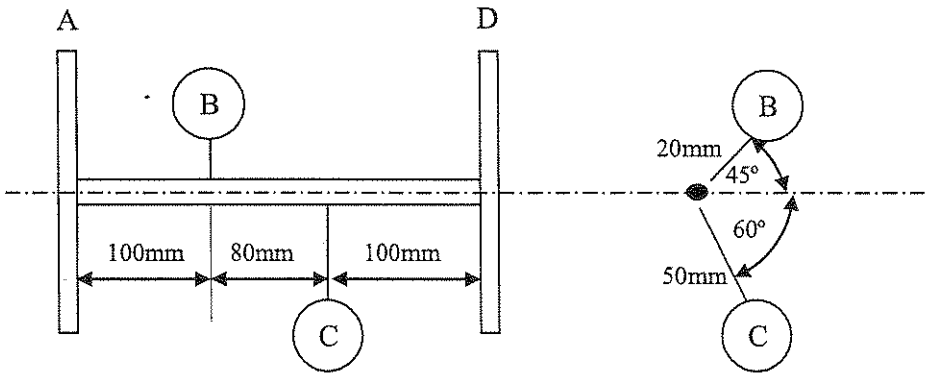


Figure 6

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; $T = \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2$

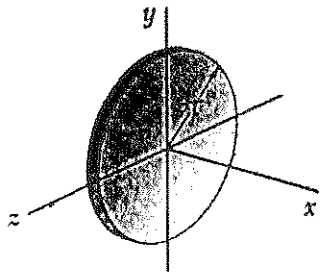
6. The potential energy; $V_e = \frac{1}{2}\,k\delta_x^2$; $V_g = mgh$

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

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

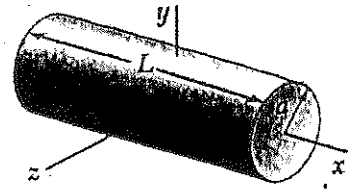
Prepared by: ISA Sept.2013

Moments of Inertia of Common Geometric Shapes



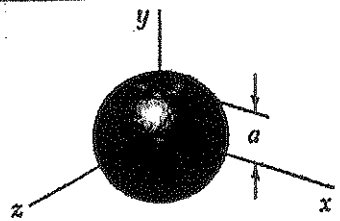
$I_x = \frac{1}{2}mr^2$

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

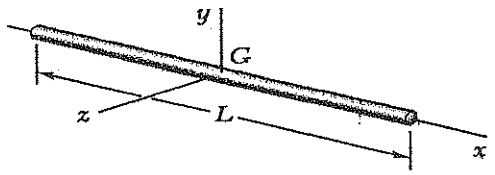


$I_x = \frac{1}{2}ma^2$

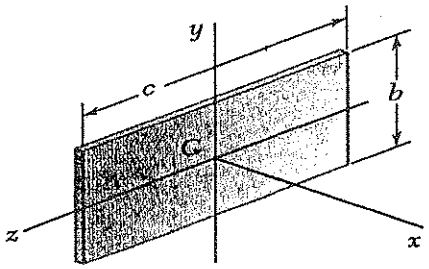
$I_y = I_z = \frac{1}{12}m(3a^2 + L^2)$



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



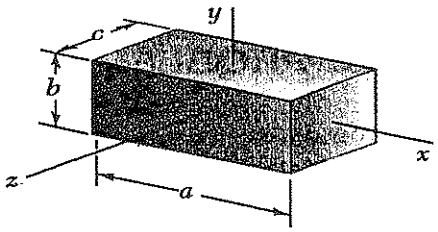
$I_y = I_z = \frac{1}{12}mL^2$



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

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

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



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

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

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