UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF MARINE ENGINEERING TECHNOLOGY

FINAL EXAMINATION
JANUARY 2017 SEMESTER

COURSE CODE	: LGB21503
COURSE NAME	: APPLIED DYNAMICS
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	: BACHELOR OF ENGINEERING TECHNOLOGY (HONS) IN NAVAL ARCHITECTURE & SHIPBUILDING
DATE	: 03/07/2017 MON
TIME	: 9.00 AM - 12.00 PM
DURATION	: 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read CAREFULLY the instructions given in the question paper.
2. This question paper has information printed on both sides.
3. This question paper consists of TWO (2) sections; Section A and Section B. Answer ALL questions in Section A and THREE (3) questions from Section B.
4. Please write yours answers on the answer booklet provided.
5. Write your answers only in BLACK or BLUE ink.
6. Answer all questions in English.

THERE ARE 7 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

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

Question 1

A train starts from rest at station *A* and accelerates at 0.5 m/s^2 for 60 s. Afterwards it travels with a constant velocity for 15 min. It then decelerates at 1 m/s^2 until it is brought to rest at station *B*. Determine,

(a) the constant velocity which the train travels for 15 min

(4 marks)

(b) the time taken by the train from when it started decelerate until it is brought to rest at station *B* and

(4 marks)

(c) the total distance between station A and station B.

(12 marks)

Question 2

The roller coaster car having a mass ***m*** is released from rest at point A. If the friction is negligible and the track is to be designed so that the car does not leave it at B, determine

(a) the required height ***h*** and

(13 marks)

(b) the speed of the car when it reaches point C.

(7 marks)

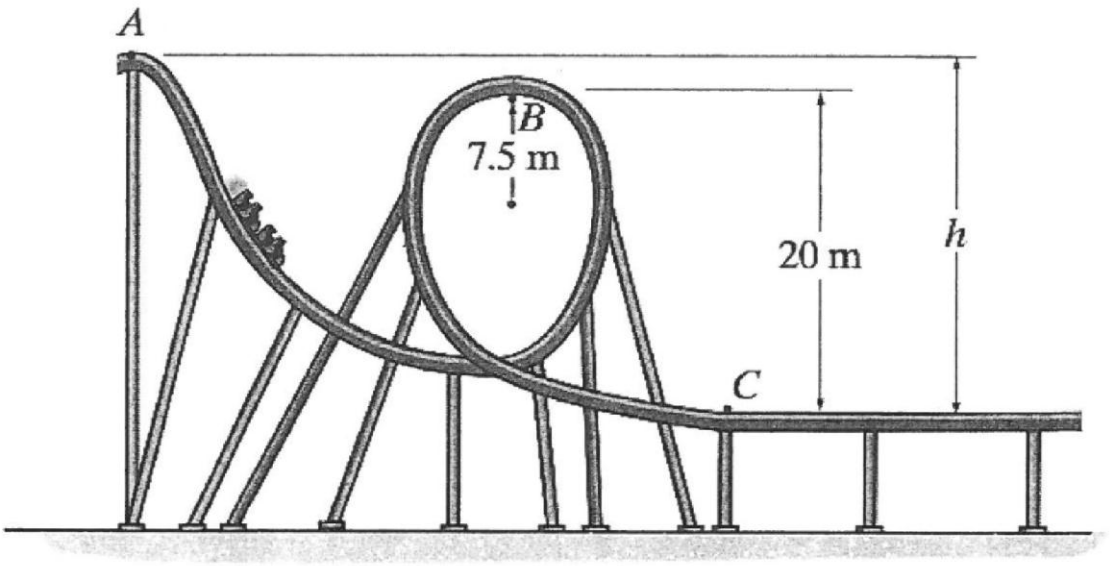

Figure 1: The position of the roller coaster car on the track

SECTION B (Total: 60 marks)

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

Question 3

A 10 kg package drops from a chute into a 24 kg cart with a velocity of 3 m/s. Knowing that the cart is initially at rest and can roll freely, determine

(a) the final velocity of the cart and

(7 marks)

(b) the impulse exerted by the cart on the package

(13 marks)

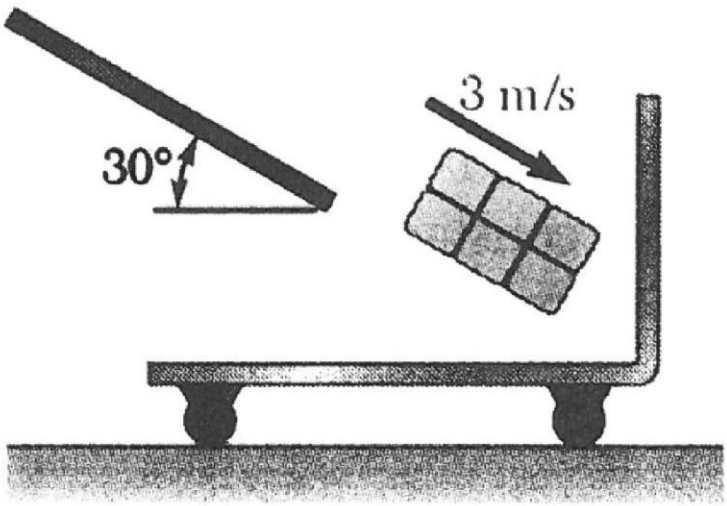

Figure 2 : The package drops into a cart

Question 4

Gears A, B, C and D have radius of 15 mm, 50 mm, 25 mm, and 75 mm, respectively. If gear A rotates with a constant angular acceleration of $\alpha_A = 90\ rad/s^2$, starting from rest, determine

(a) the time required for gear D to attain an angular velocity of 600 rpm and

(14 marks)

(b) the number of revolutions of gear D to attain this angular velocity.

(6 marks)

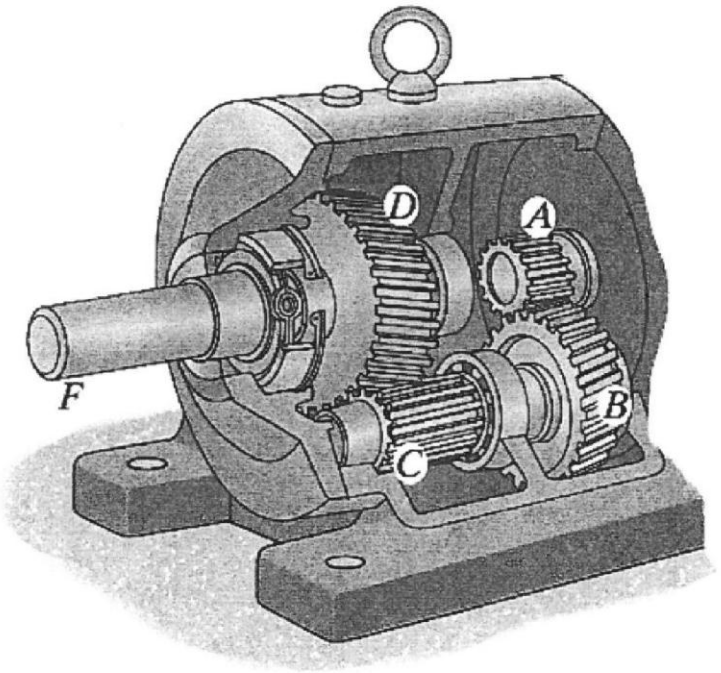

Figure 3: Four gears are rotated in same motor

Question 5

A load is to be raised 6 m by the hoisting system shown. Assuming gear A is initially at rest, accelerates uniformly to a speed of 120 rpm in 5 s, and then maintains a constant speed of 120 rpm, determine

(a) the number of revolutions executed by gear A in raising the load and

(6 marks)

(b) the time required to raise the load.

(14 marks)

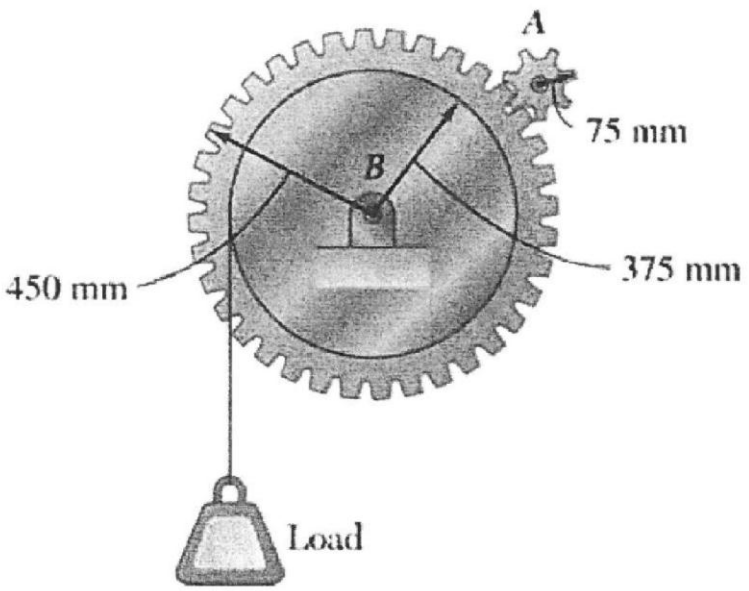

Figure 4: A load is raised by the hoisting system

Question 6

The mass on two rotors in planes B and C has shown in Figure 5 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 2.5 kg.

(20 marks)

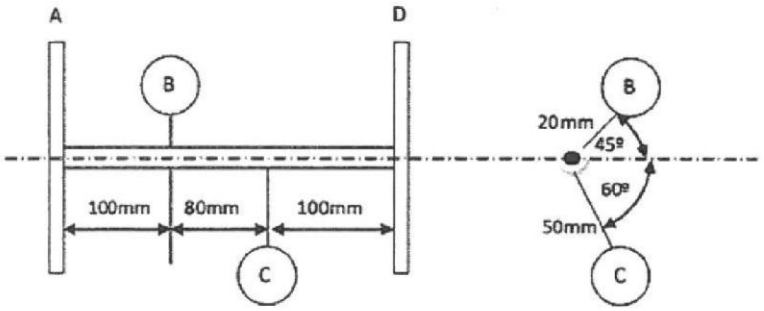

Figure 5: The mass on two rotors in plane B and C

END OF EXAMINATION PAPERS

Appendix 1 Formulae

$$C^2 = A^2 + B^2 - 2AB\cos c$$

$$\frac{A}{\sin a} = \frac{B}{\sin b} = \frac{C}{\sin c}$$

$$v = v_o + a_c t$$

$$s = s_o + v_o t + (1/2)\, a_c\, t^2$$

$$v^2 = (v_o)^2 + 2a_c(s - s_o)$$

$$T_1 + \sum U_{1-2} = T_2$$

$$e = \frac{(v_B)_2 - (v_A)_2)}{(v_A)_1 - (v_B)_1}$$

$$\Sigma\, m_i(v_i)_1 = \Sigma\, m_i(v_i)_2$$

$$m_1(v_1) + m_2(v_2) = m_1(v_1') + m_2(v_2')$$

$$\Sigma F_n = ma_n$$

$$a_n = v^2/\rho$$

$$\Sigma F_t = ma_t$$

$$T_1 + V_1 = T_2 + V_2 = \text{Constant}$$

$$mv_1 + \Sigma \int_{t_1}^{t_2} F\, dt = mv_2$$

$$\omega = \frac{d\theta}{dt} \quad \text{or} \quad dt = \frac{d\theta}{\omega}$$

$$\alpha = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2} = \omega\frac{d\omega}{d\theta}$$

$$\omega = \omega_0 + \alpha t$$

$$\theta = \theta_0 + \omega_0 t + \tfrac{1}{2}\alpha t^2$$

$$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$$