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CONFIDENTIAL

SET B

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

JANUARY 2011 SESSION

SUBJECT CODE	:	FMD 10202
SUBJECT TITLE	:	DYNAMICS
LEVEL	:	DIPLOMA
TIME / DURATION	:	12.30pm - 2.30pm (2 HOURS)
DATE	:	11 MAY 2011

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.

THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

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

Question 1

(a) The projectile is fired from ground level with initial velocity, V_A = 32 m/s at an angle, $\theta = 60°$ to the horizontal as shown in *Figure 1*. When it reaches its highest point at B, calculate the horizontal displacement from the point of projection.

(8 marks)

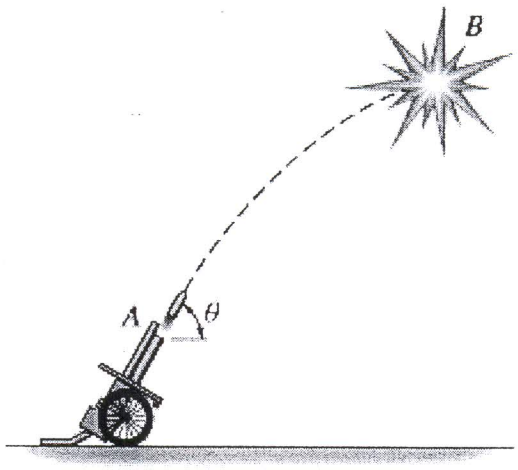

Figure 1

(b) Calculate the total distance and displacement of the plane that flies 80 km north, 50 km southeast and then 20 km east.

(12 marks)

Question 2

(a) A truck as shown in *Figure 2* has a weight of 125 kN and an engine which transmits a power of 250 kW to all the wheels. Assuming that the wheels do not slip on the ground, determine the angle θ of the largest incline the truck can climb at a constant speed of 15 m/s.

(5 marks)

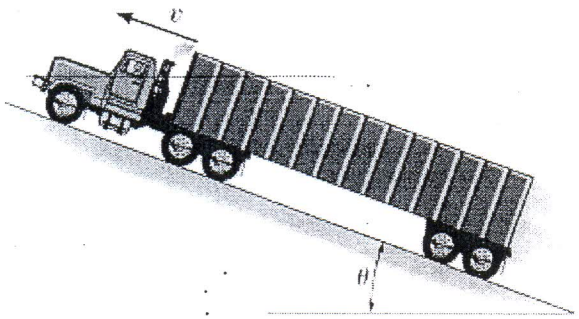

Figure 2

(b) A box slides down a smooth chute with an initial velocity of 2.9 m/s. If the chute is 10 m long and inclined at 35° to the horizontal, determine the velocity at the bottom of the chute by using the conservation of energy principle.

(5 marks)

(c) A train of mass 450 t (*Figure 3*) is drawn by a locomotive of mass 50 t, which exerts a tractive effort of 70 kN, while tractive resistance is 25 kN. Determine the distance required to reach a velocity of 90 km/h from rest, on level track.

(10 marks)

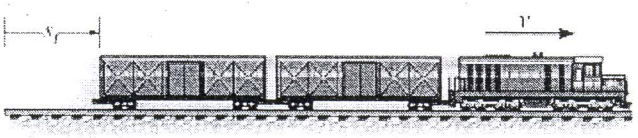

Figure 3

Question 3

(a) Gear *A* is in mesh with gear *B* as shown in *Figure 4* below. If *A* starts from rest and has constant angular acceleration of 2 rad/s^2, determine the time needed for *B* to attain an angular velocity of 50 rad/s. Express your answer in minutes.

(9 marks)

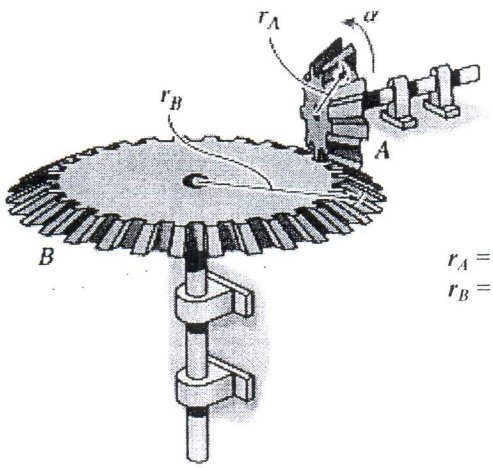

Figure 4

(b) A wheel has an initial clockwise angular motion of 96 rev/min and a constant acceleration of 3 rad/s^2. Determine the number of revolutions it must undergo to acquire a clockwise angular velocity of 143 rev/min. What is the time required?

(11 marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO questions only.
Please use the answer booklet provided.

Question 4

(a) A shaft of moment of inertia 34 kgm² is initially running at 500 rev/min. It is brought to 10 rev/min in eighteen complete revolutions by a braking torque. The friction couple is 170 Nm throughout. Find the braking torque required.

(8 marks)

(b) The Raptor as shown in the *Figure 5* is an outside loop roller coaster in which riders are belted into seats resembling ski-lift chairs. If the cars travel at 14.4 km/h when they are at the top of the hill, determine their speed when they are the top of the loop and the reaction of the passenger of mass 70 kg on his seat at this instant. The car has a mass of 50 kg. The height, h is 12 m and the radius, ρ is 5 m. Neglect friction and the size of the car and passenger.

(12 marks)

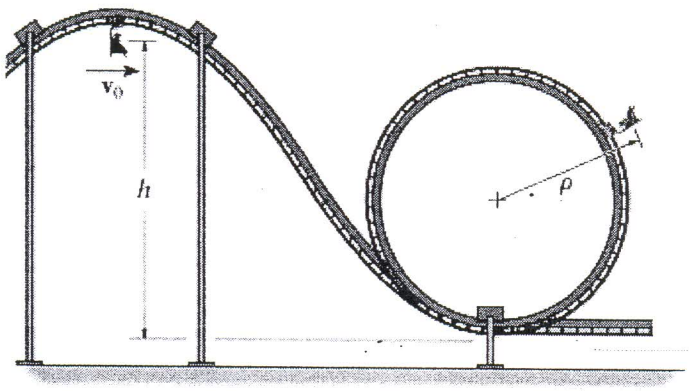

Figure 5

Question 5

The crate of mass 150 kg as shown in *Figure 6* is subjected to force F_1 of 900 N and force F_2 of 600 N, up along an inclined plane. The plane makes an angle of 30° to the horizontal, and the coefficient of kinetic friction between the plane and the crate is 0.3. Determine:

(a) the acceleration of the crate

(12 marks)

(b) the velocity of the crate in 20 seconds starting from rest

(4 marks)

(c) the displacement of the crate in 20 seconds starting from rest

(4 marks)

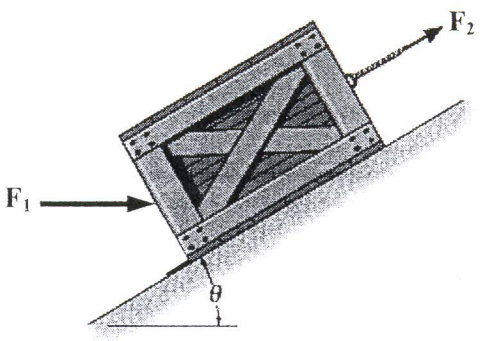

Figure 6

Question 6

(a) At the instant shown in *Figure 7*, the disk of radius 600 mm and weight 150 N has counterclockwise angular velocity of 8 rad/s when its center has velocity of 9 m/s. Determine the kinetic energy of the disk at this instant.

(9 marks)

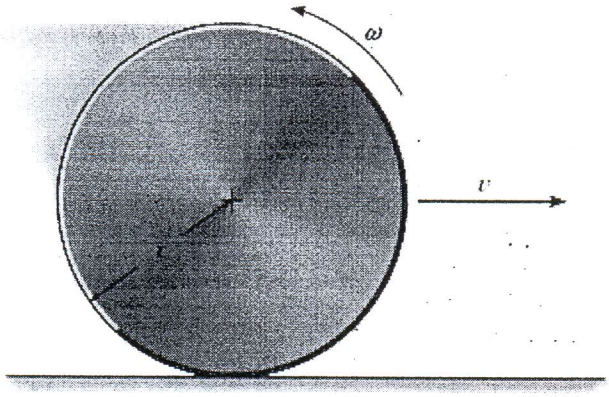

Figure 7

(b) A rocket of mass 7 t is to be launched vertically. If the flow rate of the gas is 0.1 Mg/s, determine the minimum velocity of the gas to just lift the rocket off the launching pad. If the final velocity is 800 m/s, what is the net accelerating force on the rocket?

(11 marks)

END OF QUESTION