



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JULY 2010 SESSION

SUBJECT CODE : FMB 11102
SUBJECT TITLE : STATICS & DYNAMICS
LEVEL : BACHELOR
TIME / DURATION : 12.30pm – 3.00pm
(2.5 HOURS)
DATE : 08 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 **FIVE (5)** questions. Answer **FOUR (4)** questions only.
 6. Answer all questions in English.
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THERE ARE 3 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer only FOUR (4) questions.
Please use the answer booklet provided.

Question 1

The following coplanar system of forces has the following values:

$$F_1 = 13 \text{ N @ } 20^\circ, \quad F_2 = 19 \text{ N @ } 57^\circ, \quad F_3 = 32 \text{ N @ } 90^\circ, \quad F_4 = 28 \text{ N @ } 462^\circ$$

- (a) Draw a graphical representation of the system using an appropriate scale to determine the resultant force and briefly explain your answer.
(12 marks)
- (b) Find the value of the equilibrium force for part (a) by using the calculation method.
(13 marks)

Question 2

- (a) Determine the moment of the force $F = (i + 1.5j - 0.5k)$ N acting through the coordinate (3, 1, 1) with respect to the line passing from (4, 10, -4) through (6, -2, 2). The coordinates are in meters.
(15 marks)
- (b) Calculate the moment of a force, P whose rectangular components are $P_x = 11$ N, $P_y = 22$ N and $P_z = 33$ N and acting at a point (2, -2, -4). Take the moment about a line from the origin through the point (6, -2, 0). Coordinates are in meters.
(10 marks)

Question 3

- (a) Explain clearly with simple examples Newton's Laws of motion. (12 marks)
- (b) List down and explain with simple examples the five (5) common Laws of Friction. (13 marks)

Question 4

- (a) A particle moves on a vertical line with an acceleration of $a = 4\sqrt{v}$. When $t = 4$ s, its displacement $s = 22$ m and its velocity $v = 32$ m/s. Determine the displacement, velocity and acceleration of the particle when $t = 8$ s. (15 marks)
- (b) An ball is thrown vertically upward with a velocity of 40 m/s. Five seconds later a second ball is projected vertically upward with a velocity of 80 m/s. Calculate the distance above the ground where both the objects will meet. (10 marks)

Question 5

- (a) A particle moves on a path with a velocity vector as follows:-

$$v = (3t^2 i - 4t j + 2 k) \text{ m / s.}$$

- i. Determine the coordinates of its position after 10 s. (3 marks)
- ii. Determine the equation of its path. (4 marks)
- iii. Determine the projection of the velocity vector in the direction of the vector, $n = (i + j - k)$ when $t = 2$ s. (4 marks)

- (b) A man of mass 90 kg slides down a slide of height 15 m and length 20 m in a park. Assuming the coefficient of friction exerted on the man during the entire trip down the slide to be 0.23, calculate the:

- i. kinetic energy of the man at the bottom end of the slide. (7 marks)
- ii. final velocity of the man at the bottom end of the slide. (7 marks)

END OF QUESTION