CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION
FEBRUARY 2025 SEMESTER SESSION

SUBJECT CODE	:	**LED12202**
SUBJECT TITLE	:	**STATIC AND DYNAMICS**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**DIPLOMA OF ENGINEERING TECHNOLOGY IN ELECTRICAL AND ELECTRONICS (MARINE)**
TIME / DURATION	:	**9.00 AM – 11.30 AM (2 HOURS 30 MINUTES)**
DATE	:	**30 JUNE 2025**

INSTRUCTIONS TO CANDIDATES

1. Please read CAREFULLY the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of TWO (2) sections; Section A and Section B.
4. Answer ALL THREE (3) questions in Section A. For Section B, answer TWO (2) question ONLY.
5. Please write your answers on the answer booklet provided.
6. Answer all questions in English language only.
7. Formula is appended for your reference.

THERE ARE 7 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

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

Question 1

Concerning the equilibrium of a particle

Determine the tension in cables *BA* and *BC* necessary to support the 60-kg cylinder in Figure 1.

(20 marks)

)

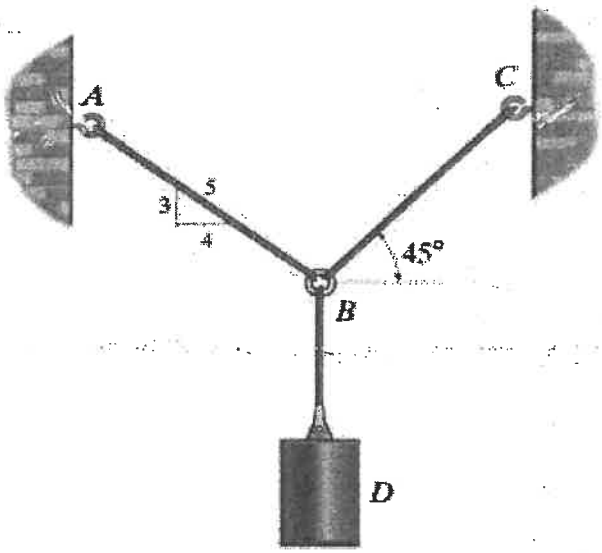


Figure 1

Question 2

With reference to the components and resultant forces:

(a) State TWO (2) conditions for equilibrium of force.

(2 marks)

(b) The member of the trusses in Figure 2 are connected at joint O. Determine the magnitude (resultant force) of the trusses and its angle θ for equilibrium. Given F_2 = 6 kN.

(10 marks)

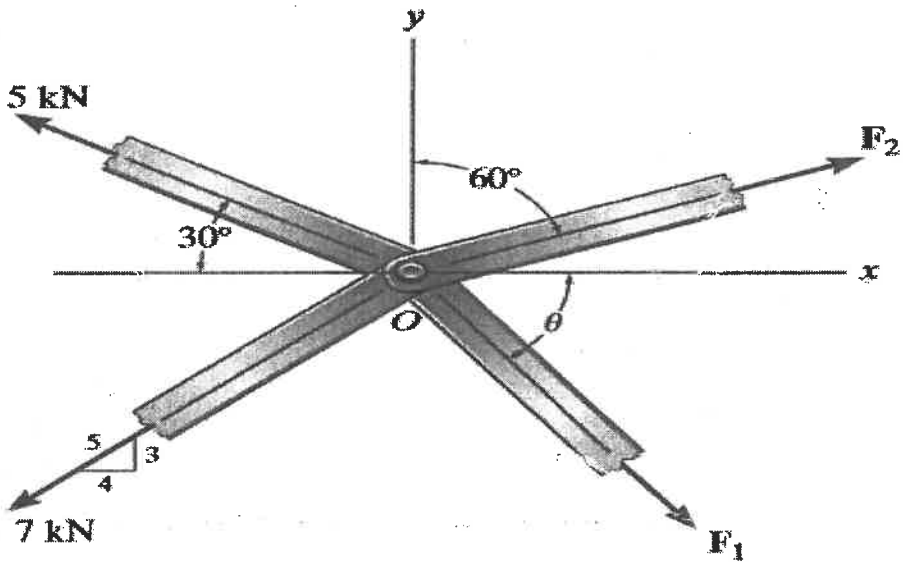


Figure 2

(c) For each case shown in figures 3, ,4 and 5 below, determine the moment of force about point O.

i.

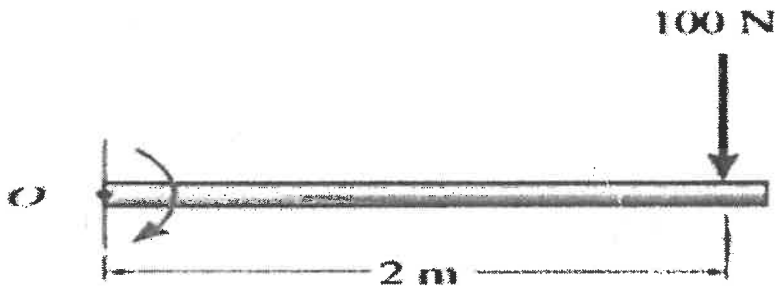


Figure 3

(2 marks)

ii.

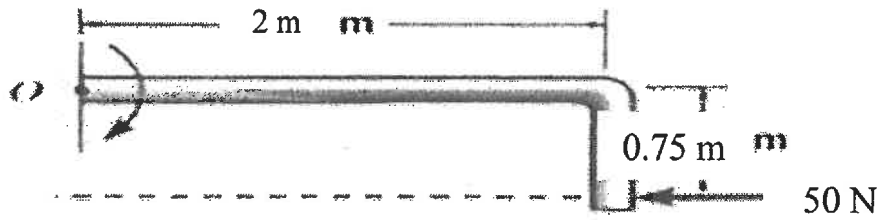


Figure 4

(2 marks)

iii.

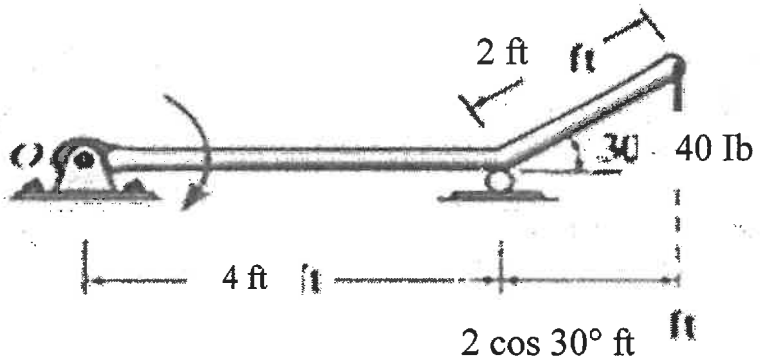


Figure 5

(4 marks)

50

Question 3

With reference to the center of gravity and centroids:

Determine the centroid $(\bar{x}, \bar{y})$ of the plate as shown in figure 6.

(20 marks)

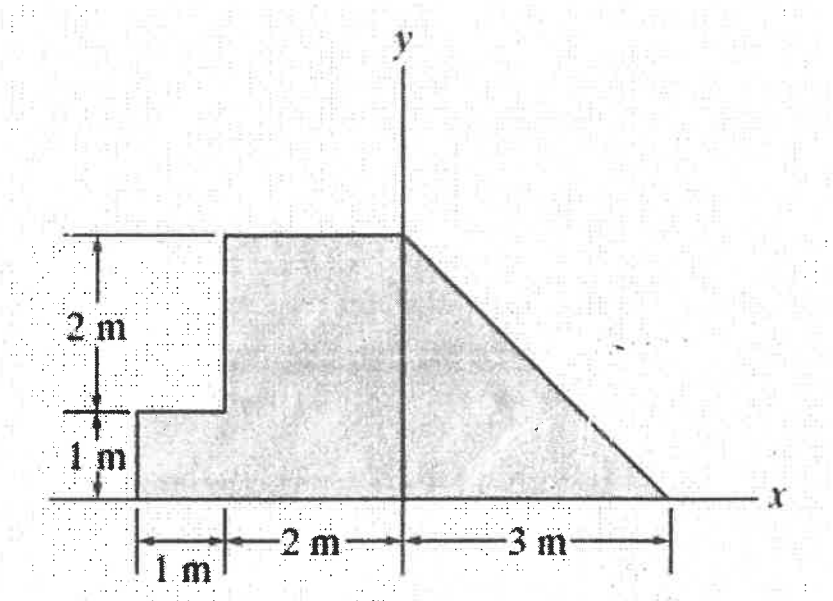


Figure 6

SECTION B (Total: 40 marks)

INSTRUCTION: Answer only TWO (2) questions.
Please use the answer booklet provided.

Question 4

With reference to kinematics and dynamics:

(a) Initially, the car travels along a straight road with a speed of 35 m/s. If the brakes are applied and the speed of the car is reduced to 10 m/s in 15 s, determine the constant deceleration of the car.

(5 marks)

Figure 7

(b) A ball is thrown vertically upward with a speed of 15 m/s. Determine the time of flight when it returns to its original position.

(5 marks)

Figure 8

(c) A bicycle moves along a straight road such that its position is described by the graph shown in Figure . Construct the *v-t* graphs for 0 ≤ t ≤ 30 s.

(10 marks)

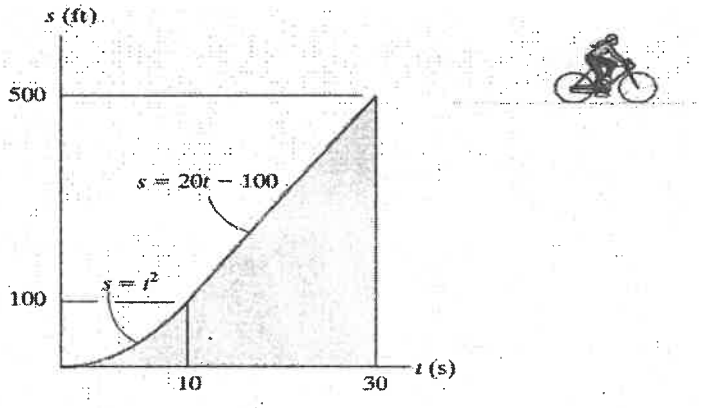


Figure 9

Question 5

With reference to the work, energy, and momentum:

(a) The spring is placed between the wall and the 10-kg block. If the block is subjected to a force of F = 500 N, determine its velocity when s = 0.5 m. When s = 0, the block is at rest and the spring is uncompressed. The contact surface is smooth. (refer to Figure 10)

(10 marks)

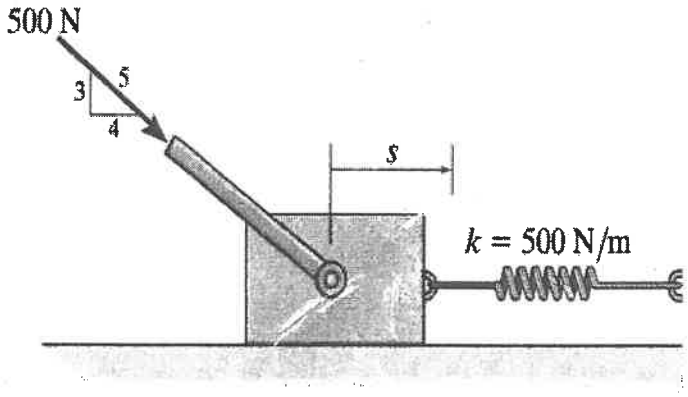


Figure 10

(b) If the motor exerts a constant force of 300 N on the cable, determine the speed of the 20-kg crate when it travels s = 10 m up the plane, starting from rest. The coefficient of kinetic friction between the crate and the plane is μ_k = 0.3. (refer to Figure 11)

(10 marks)

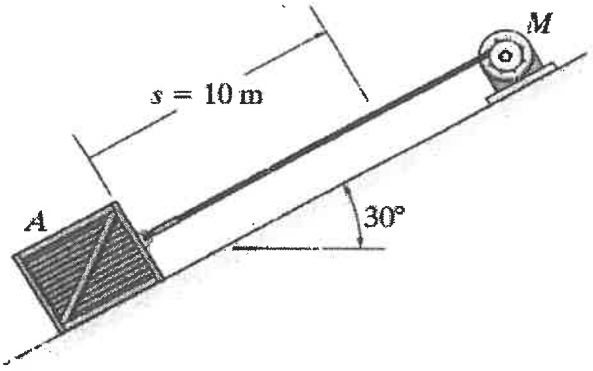


Figure 11

Question 6

With reference to the work, energy, and momentum.

(a) Explain the principle of ***conservation of momentum.***

(4 marks)

(b) Two rail cars with masses of m_A = 20 Mg and m_B = 15 Mg and velocities as shown in figure 12.

i. Determine the speed of car A after the collision if the cars collide and rebound such that B moves to the right with a speed of 2 m/s. the **velocity** of each block just after collision

(8 mar ks)

ii. Calculate the average impulsive force between the cars if the collision place in 0.5 s.

(8 marks)

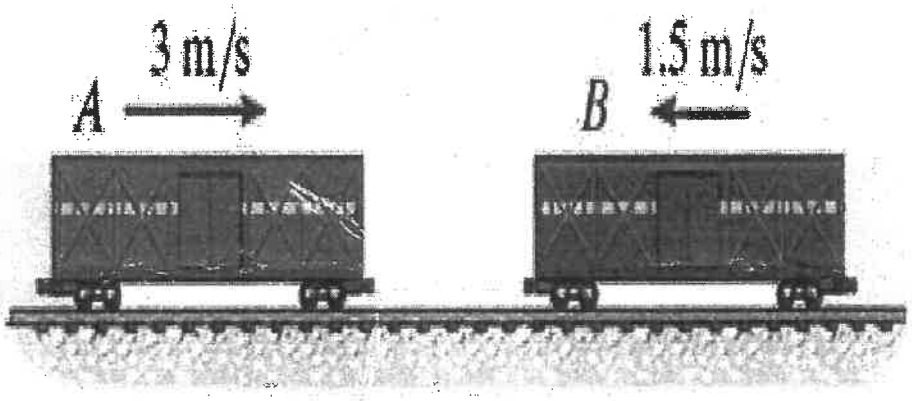
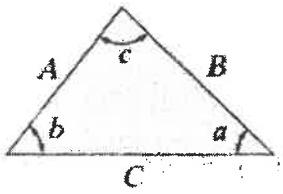


Figure 12

END OF EXAMINATION PAPER

Appendix 1 Formulae

$F_s = ks$ $v = v_o + a_c t$ $s = s_o + v_o t + (1/2)\, a_c t^2$ $v^2 = (v_o)^2 + 2a_c(s - s_o)$	$\sum mv_1 = \sum mv_2$ $T_1 + \sum U_{1-2} = T_2$ $e = \dfrac{(v_B)_2 - (v_A)_2)}{(v_A)_1 - (v_B)_1}$
$\bar{x} = \dfrac{\sum \tilde{x} A}{\sum A}$ $\bar{y} = \dfrac{\sum \tilde{y} A}{\sum A}$	$k_{x'} = \sqrt{\dfrac{I_{x'}}{A}}$
$a_n = \dfrac{v^2}{\rho}$ $a_t = v = \dfrac{dv}{dt} =$ $a = \sqrt{{a_t}^2 + {a_n}^2}$	$I_x = I_x + A\,(d_y)^2$ $x_B = x_A + (v_A)_x t$ $y_B = y_A + (v_A)_y t + \dfrac{1}{2}\, a_y\, t^2$
	**Cosine law:** $C = \sqrt{A^2 + B^2 - 2AB\cos c}$ **Sine law:** $\dfrac{A}{\sin a} = \dfrac{B}{\sin b} = \dfrac{C}{\sin c}$
$F_{Rx} = \sum F_x$ $F_{Ry} = \sum F_y$	$F_R = \sqrt{F_{Rx}^2 + F_{Ry}^2}$ and $\theta = \tan^{-1}\left\lvert\dfrac{F_{Ry}}{F_{Rx}}\right\rvert$