CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION
FEBRUARY 2025 SEMESTER SESSION

SUBJECT CODE	:	**LMD12703** / LMD13503 / LED11303
SUBJECT TITLE	:	**ENGINEERING SCIENCE**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**DET IN ELECTRICAL AND ELECTRONICS (MARINE)** **DET IN MARINE ENGINEERING**
TIME / DURATION	:	**09.00AM – 11.30AM** **(2 HOURS 30 MINUTES)**
DATE	:	**1 JULY 2025**

INSTRUCTIONS TO CANDIDATES

1. Please CAREFULLY read 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 questions in Section A, and only TWO (2) questions in Section B.
5. Please write your answers on the answer booklet provided.
6. Answer all questions in ENGLISH language only.
7. Table of Formulae has been appended for your reference.

THERE ARE 8 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

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

Question 1
Concerning the linear motion, dynamics, fluid and heats:

(a) State Newton's First Law of Motion and Newton's Second Law of Motion

(6 marks)

(b) Differentiate between velocity and acceleration

(4 marks)

(c) Explain the term atmospheric pressure

(4 marks)

(d) Explain the temperature of a substance

(3 marks)

(e) State three (3) methods of heat transfer

(3 marks)

Question 2

(a) A speedboat that is initially at rest moves along a straight line and reached a speed of 10 m/s in 50 s. Determine:

i. the acceleration of the speedboat

(3 marks)

ii. the distance made by the speedboat in 50

(3 marks)

iii. the velocity in the next 30 s if the speedboat continues its motion with constant acceleration

(4 marks)

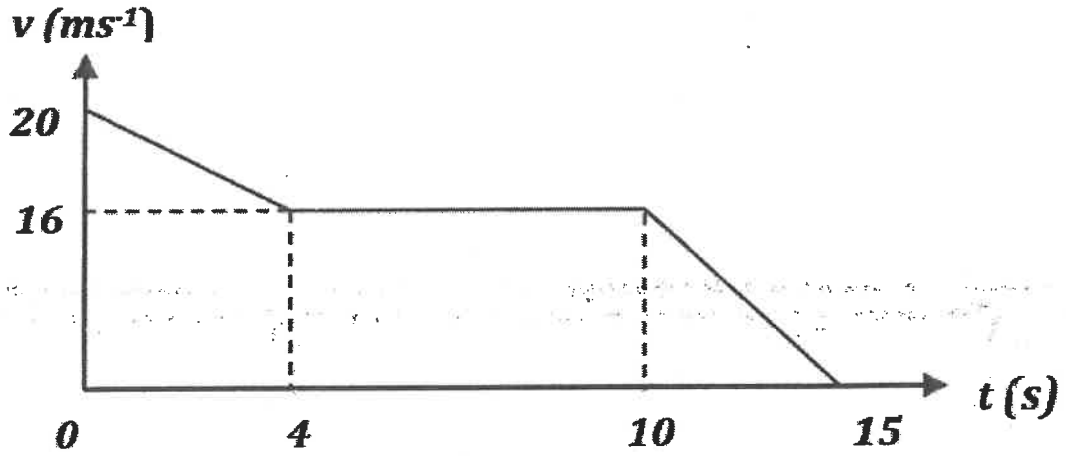

Figure 1

(b) Figure 1 shows a velocity versus time graph of moving object.

i. When does the object move with constant velocity?

(2 marks)

ii. Determine the acceleration of the object in,

(a) the first 4 s

(2 marks)

(b) the last 5 s

(2 marks)

iii. Find the distance traveled by the object when it is moving with constant velocity

(2 marks)

iv. Determine the total distance traveled by the object.

(2 marks)

Question 3

With reference to work, energy and power:

(a) A hoop of mass 4 kg is moving horizontally with a speed of 2 m/s. Calculate:

i. the work done on the hoop to change its speed to 6 m/s.

(4 marks)

ii. the constant force that would do this work in a distance of 8 m.

(3 marks)

iii. the power expended to change the speed in a time of 3.0 s.

(3 marks)

(b) The kinetic energy of the vehicle is 8 x 106 J as moves on a horizontal plane.

i. Compute power is required to stop the vehicle in 20 s

(3 marks)

ii. Determine the force required to stop the vehicle in 20 s if it mass is 1500 kg

(3 marks)

(c) An electric motor consumes 100 Watts of power to obtain 90 Watts of mechanical power.

Determine the percentage of efficiency.

(4 marks)

SECTION B (Total: 40 marks)

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

Question 4

With reference to Newton's Law of Motion:

Figure 2 shows a pulley system which consists of a load (m_2 = 10 kg) hanging over a smooth pulley. A wooden block (m_1 = 20 kg) is placed on a rough surface which has coefficient of friction, μ = 0.18. After being released, the system accelerates in the direction as shown.

(a) Sketch the free body diagram to show all the forces acting on objects.

(6 marks)

(b) Determine the frictional force acted between m1 and the surface.

(6 marks)

(c) Calculate the acceleration of the system.

(8 marks)

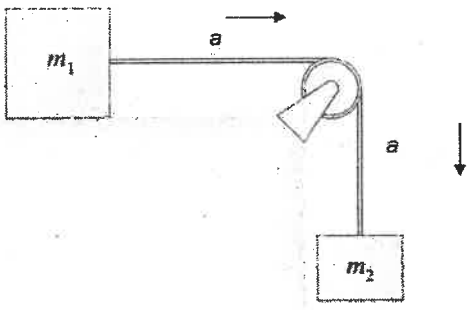

Figure 2

Question 5

With reference to rotational motion and simple harmonic motion:

(a) A wheel of radius 0.4 m starts rotating from rest and after 6 s its angular velocity is 3.6 rad/s. Calculate:

i. the angular acceleration of the wheel

(4 marks)

ii. the angular velocity after 3.0 s

(4 marks)

iii. the tangential acceleration

(4 marks)

(b) A mass which hangs from the end of a vertical helical spring is in SHM of amplitude 2cm. If three complete oscillations take 4.0 s, determine the acceleration of the mass:

i. at the equilibrium position

(4 marks)

ii. when the displacement is maximum

(4 marks)

Question 6

With reference to fluid and heat:

(a) An oil manometer is used to measure the pressure of the gas in a tank as shown in Figure 4. The specific gravity of the oil is 0.8, the atmospheric pressure is 120 kPa and the manometer column height is 90 cm. Determine:

i. the density of the oil

(4 marks)

ii. the pressure of the gas in the tank

(4 marks)

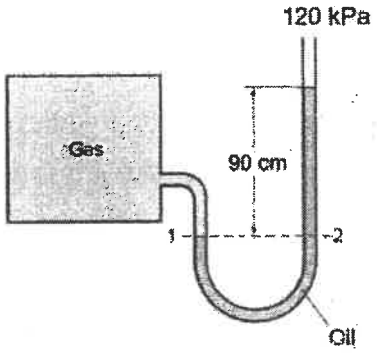

Figure 3

(b) The amount of heat produced when 2 kg petrol is completely burned is 96 000 kJ. Determine:

i. the calorific value of the petrol

(3 marks)

ii. the useful energy released by 300 g petrol

(3 marks)

(c) A coal sample contains 82% carbon, 8% hydrogen, 3% oxygen, 1% Sulphur, 2% nitrogen and 4% ash by mass. Determine:

i. the higher caloric value

(3 marks)

ii. lower calorific value of the coal.

(3 marks)

END OF QUESTION PAPER

1. Table of Formulae

$v = u + at$	$s = ut + \frac{1}{2}at^2$	$s = \frac{1}{2}(u + v)t$
$v^2 = u^2 + 2as$	$F = ma$	$F_f = \mu F_N$
$W = mg$	$W = F\cos\theta \, . x$	$W = KE_f - KE_i$
$KE = \frac{1}{2}mv^2$	$PE = mgh$	$P = \frac{W}{t}$
$\omega_f = \omega_i + \alpha t$	$\theta = \frac{1}{2}(\omega_i + \omega_f)t$	$\theta = \omega_i t + \frac{1}{2}\alpha t^2$
$\omega_f{}^2 = \omega_i{}^2 + 2\alpha\theta$	$f = \frac{1}{T}$	$\omega = 2\pi f$
$\omega = \sqrt{\frac{k}{m}}$	$a = -\omega^2 x$	$v = \omega\sqrt{A^2 - x^2}$
$SG = \frac{\rho_{substance}}{\rho_{water}}$	$\rho = \frac{m}{V}$	$P = \rho gh$
$P = \frac{F}{A}$	$Q = mc\Delta T$	$\frac{Q}{t} = \frac{kA\Delta T}{l}$

2. Constant Values

Gravitational acceleration, 9 = 9.81 m/s^2
Density of water = 1000kg/m^3
Standard atmospheric pressure = 1 atm = 1.013 x 10^5 Pa