الجامعة الوطنية
National University
Science & Technology للعلوم والتكنولوجيا
كلية عمان البحرية الدولية
International Maritime College Oman

ACADEMIC YEAR 2023 - 2024

Program	Year	Semester	Paper
ME	1	1	MAIN

MODULE NAME:	**PHYSICS – I**		
MODULE CODE:	**MPHYS – I**	**EXAM DATE:**	**28/12/2023**
INSTRUCTOR's NAME:	**Jahanzeb Khan**	**DURATION:**	**2 hrs**

Questions to be answered on:	**Allowed tools:**	**Number of pages**
✓ Space provided on the question paper	Pen, Pencil & Calculator	(Incl. cover page)**:** **09**

Points of attention:

- For each question, the maximum earned points are mentioned between brackets at the end of each question.
- Write very clearly! Answers that are not readable are not marked and don't get points!
- Make sure your answers are written to the point.
- All answers should be written **in English.**
- Write all the answers in **blue or black pen only.**
- Use the **pencil** only for **diagrams & graphs.**
- Show all the calculation steps in the given space.
- When finished submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- Any cheating/copying may result in an instant failing of the examination.

STUDENT NAME:

STUDENT ID:

FINAL MARKS	
	50
	10

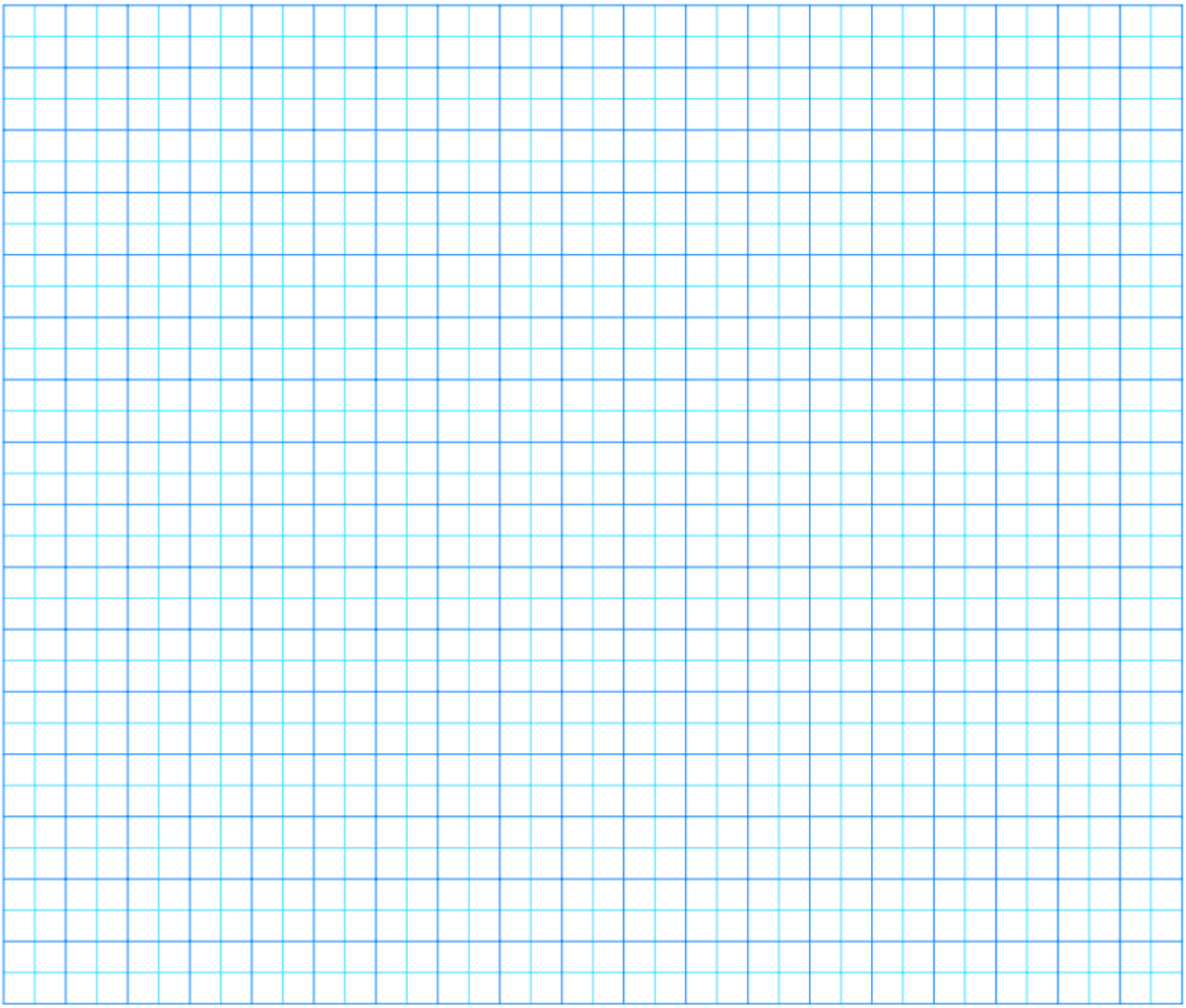
Number of answer scripts:……..…….. **Invigilator:**……..……..

Student's signature: …… **Time of receipt:**……..…..

Question 1 **[Total Marks 10]**

A cargo ship is passing through Suez Canal. Before entering the Suez Canal the ship moves with and average speed of 20 km/h for 3 hours. While entering the Suez Canal the speed of the ship reduces to 8 km/h in 2 hours. Its then continue its journey at the same speed for the next 14 hours. After exiting the Suez Canal, the speed of the ship increases from 8 km/h to 25 km/h in 3 hours.

(a) Plot the graph for the whole journey of the ship during this observed time. (4 marks)



(b) Calculate the negative acceleration of the ship according in SI unit. (2 marks)

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(c) Calculate the total distance travelled by the ship during this observed time. (4 marks)

Question 2 **[Total Marks 10]**

(a) The volume of engine oil inside a ship engine is 29 m^3. Convert m^3 to cm^3 and write your answer using scientific notation. (2 marks)

(b) The volume of a cylindrical tank is $12x10^6$ m^3 and it is completely filled by diesel. If the height of the tank is 8 m then, Calculate the diameter of the tank. (3 marks)

(c) If the density of diesel is 0.85 g/cm^3. Calculate the total mass of the oil in the tank. (3 marks)

(d) During engine operation, a significant amount of heat will be absorbed by the engine oil. How the heat affects density. (2 marks)

Question 3 **[Total Marks 10]**

A dock side crane is loading a 40 feet container to a vertical height of 26 m on the ship.

The total mass of the container is 6 tonne and the crane takes 6 minutes to lift the container.

(a) Calculate the workdone by the crane to lift the container to the height of 26 m. (3 marks)

(b) Calculate the power consumed by the crane to lift the container to the height of 26 m. (2 marks)

(c) If electrical energy of 2.4 MJ is supplied to the motor of the crane. Determine the efficiency of the crane. (3 marks)

(d) Why input energy is more than output. Give two suitable reasons. (2 marks)

Question 4 **[Total Marks: 10]**

(a) Define mutual induction and discuss the factors upon which it depends. (3 marks)

(b) Explain the working of transformer by drawing a neat and labelled diagram. (4 marks)

(c) An ideal step-down transformer is connected to a main supply of 240V. It is desired to operate a 12V, 30W lamp.

(i) Calculate the current in the primary coil. (1.5 marks)

(ii) Determine the transformation. (1.5 marks)

Question 5 **[Total Marks 10]**

The total mass of an oil tanker is 210,000 Tonnes. The oil tanker is taking 2.5 hours to gain an average speed of 32 km/h from rest.

(a) Calculate the total weight of the oil tanker and write your answer in scientific notation. (3 marks)

(b) Determine the force acting upon the ship for 3 hours to gain an average speed of 32 km/h from rest. (5 marks)

(c) The engine is continuously exerting the same force as calculated in part (b), but the speed of the ship remains constant after 3 hours. Discuss the factors due to which the speed of the ship is not increasing. (2 marks)

CONVERSION OF PHYSICAL QUANTITIES

Conversion of Length		***Conversion of Mass***		***Conversion of Time***	
1km	*10^{3} m*	*1 Kg*	*10^{3} g*	*1 year*	*365 days*
1m	*10^{-3} km*	*1 g*	*10^{-3} Kg*	*1 month*	*30 days*
1m	*10^{2} cm*			*1 day*	*24 hours*
1cm	*10^{-2} m*	*1 g*	*10^{3} mg*	*1 hour*	*60 minutes*
1m	*10^{3} mm*	*1 mg*	*10^{-3} g*	*1 minute*	*60 seconds*
1 mm	*10^{-3} m*				
1m	*10^{6} μm*	*1 Kg*	*10^{6} mg*	*1 second*	*10^{3} ms*
1 μm	*10^{-6} m*	*1 mg*	*10^{-6} Kg*	*1 ms*	*10^{-3} seconds*
1m	*10^{9} nm*				
1 nm	*10^{-9} m*	*1 g*	*10^{6} μg*	*1 second*	*10^{6} μs*
1m	*10^{12} pm*	*1 μg*	*10^{-6} g*	*1 μs*	*10^{-6} seconds*
1 pm	*10^{-12}m*				
1 mile	*1.60934 Km*	*1 Kg*	*10^{9} μg*	*1 second*	*10^{9} ns*
1 Km	*0.621371 miles*	*1 μg*	*10^{-9} Kg*	*1 ns*	*10^{-9} seconds*
1 nautical mile	*1.15078 miles*				
1 mile	*0.868976 nautical miles*	*1 Tone*	*10^{3} Kg*	*1 second*	*10^{12} ps*
1 nautical mile	*1.852 Km*	*1 Kg*	*10^{-3} Tone*	*1 ps*	*10^{-12} seconds*
1 Km	*0.5399 nautical mile*				