NATIONAL SENIOR CERTIFICATE EXAMINATION
MAY 2023

MARITIME ECONOMICS

Time: 3 hours 300 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 12 pages. Please check that your question paper is complete.
2. Read the questions carefully before answering.
3. Answer all questions.
4. Answer the questions in the same order that they appear on the question paper.
5. Show all working where calculations are involved.
6. It is in your own interest to write legibly and to present your work neatly.

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QUESTION 1 THE MARITIME WORLD

1.1 A Japanese shipowner has built a vessel with large computer-controlled 'sails' that open and close according to the wind. The vessel also has a standard main engine that provides sufficient power for the ship to reach a service speed of 15 knots.

1.1.1 Explain why the shipowner decided to build a ship with this type of 'sails'. (6)

1.1.2 Under what conditions would the 'sails' **NOT** be useful to propel the ship? (4)

1.1.3 List two ways (other than developing different types of propulsion) in which shipowners are trying to reduce sulphur and carbon emissions in their ships. (4)

1.2 An aluminium smelter has been built at Port Omega and bauxite (the raw material from which aluminium is ultimately made) has to be imported, while the aluminium ingots are exported in containers and other alumimium products are exported in bulk. During the construction process, large and heavy items for the smelter and the entire production process were landed at the port. Look at the table below and answer the questions set.

SHIPS CALLING AT PORT OMEGA

	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Present Year**
Containerships	1095	1124	1004	1360	1399	1352
Bulkers	332	358	319	1228	1342	1354
Product Tankers	165	162	177	431	452	446
Multi-Purpose Ships	612	713	738	943	962	955
Heavylift Ships	26	38	55	03	00	00

1.2.1 In which year did the aluminium smelter begin producing aluminium? (2)

1.2.2 Which type of ship would you see more often in Port Omega now? (2)

1.2.3 Which type of ship would have brought the large, heavy items that would have been installed in the aluminium smelter? (2)

1.2.4 Give two types of cargo that Product Tankers carry. (4)

1.2.5 Which two types of ship now carry containerised aluminium ingots that are being exported through Port Omega? (4)

1.2.6 How many containerships a week are now calling at Port Omega? (6)

1.2.7 Explain the trend shown for the number of heavylift ships calling at Port Omega. (6)

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1.2.8 Liquid pitch (a substance that is similar to tar used on roads) is required during the aluminium smelting process. Which ship type would be required to carry the liquid pitch? (2)

1.2.9 There has been an increase in shipping at Port Omega.

(a) Referring to the types and numbers of ships calling, what additional facilities and equipment will have been built/ installed for the increase in shipping at the port? (10)

(b) List four types of shipping-related employment that will have shown an increase over the past six years? (8)

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QUESTION 2 SHIPPING OPERATIONS

2.1 Here are some details about the bulk carrier *Corfu*

She has five holds; each hold has a crane; she has a bulbous bow, and her superstructure and engine room are aft.

Length		180 metres
Loaded Draught		12 metres
Freeboard when loaded		5 metres
Owner		Corfu Shipping, Piraeus, Greece
Managers		Patris Ship Management, Piraeus, Greece
Charterer		XYZ Rolled aluminium Distributors, Israel
Corfu is on a **time charter**		beginning at 00:01 on 1 June until 31 December 2023 during which time she is expected to complete **5 laden** voyages carrying rolled aluminium from Port Omega to Port Alpha. She is on her first voyage, and the time on charter can be extended if delays are encountered.
Insurers	H&M	Lloyd's
	P&I	North of England P&I Club
Cargo		29 900 tons of rolled aluminium
Cargo distribution		No 1 Hold 4 000 tons
		No 2 Hold 6 000 tons
		No 3 Hold 6 500 tons
		No 4 Hold 6 900 tons
		No 5 Hold 6 500 tons
Origin of Cargo		Omega Alu-smelt, Port Omega
Loading port		Port Omega
Discharge Port		Port Alpha
Destination of Cargo		Alpha Aluminium Distributors, Port Alpha
Value of Ship		$42 million
Value of Cargo		$24 million
Value of Bunkers on board		$920 000 (owned by the shipowner)

2.1.1 Referring to the details given, draw a diagram of this ship from bow to stern in her loaded state and viewed from the PORT side. Use labels to show all available information about the vessel and her cargo. (10)

2.1.2 What type of bulk carrier is *Corfu*? (2)

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2.1.3 Assume the following when the cargo is to be loaded in Port Omega:

- Loading will be done by the ship's cranes at a rate of 150 tons an hour by **each** crane, working simultaneously.
- Loading is scheduled to begin at 08:00 on 2 June and will continue through the night, apart from breaks.
- Breaks (tea breaks, change of shift, etc.) will total 12 hours for the duration of the loading process.
- A strike by stevedores will mean that no loading can done from 06:00 to 18:00 on 4 June.
- Before she can sail, various clearance procedures will take five hours **once cargowork has been completed**.

(a) How many hours will it take to complete the loading of the cargo, **including breaks but excluding the other stoppages**? Round off to the NEXT hour, e.g. 22.2 becomes 23 hours. (6)

(b) How many hours will the entire loading process take? **Include breaks and other stoppages**. (6)

(c) When will the loading of the cargo be finished? (6)

(d) When will she leave Port Omega? (6)

(e) List three tasks that need to be completed during the time between the ship finishing loading and her departure from Port Omega. (6)

(f) Assume that the agreed laytime is 53 hours, including breaks, but excluding other stoppages. Did the loading process – including breaks, but excluding other stoppages – take longer than the agreed time? Answer YES or NO. (2)

(g) Which will be payable: demurrage or dispatch? (2)

(h) Who will be liable for payment? Choose your answer from:

SHIPOWNER or CHARTERER or CARRIER or AGENT (2)

2.1.4 Assume that the cargo is being carried FIO (the INCOTERM for free in and out). **Choosing your answers from either SHIPPER or CONSIGNEE,** who pays for each of the following:

(a) the costs of loading the cargo of rolled aluminium in Port Omega. (2)

(b) the ocean freight costs between Port Omega and Port Alpha. (2)

(c) the costs of discharging the cargo in Port Alpha. (2)

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2.2 Irrespective of your answers elsewhere in this examination paper, note the following information, and use it to calculate your answers to the questions that follow:

- A Round Voyage is from the ship's arrival off Port Omega to her return to Port Omega.
- Estimated times

Loading in Port Omega	3 days
At sea from Port Omega to Port Alpha	18 days
Discharging in Port Alpha	5 days
At sea from Port Alpha to Port Omega	18 days
Time allowed for anchoring in each round voyage	4 days

She will pass through the Suez Canal on the outward voyage and on the homeward voyage. One day should be added for **each** transit of the Canal.

2.2.1 How many days will one round voyage take? (6)

2.2.2 Will *Corfu* be able to complete five **laden** voyages from Port Omega to Port Alpha within the period of the charter? Answer YES or NO but show the calculations that you used for your answer. (6)

2.2.3 Will the charter need to be extended to accommodate five laden voyages? Answer YES or NO but show the calculations that you used for your answer. (6)

2.3 *Corfu* uses the following amount of fuel:
HFO 34 tons per day when at sea only
MDO 3 tons per day at sea, in port and at anchor
She bunkers only in Port Omega where the fuel prices are as follows:
HFO $495 per ton
MDO $610 per ton

What is the total cost of the fuel for one round voyage? (6)

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2.4 Read the following report and answer the questions that follow:

At 10:00 on 9 June on *Corfu's* first voyage to Port Alpha, a fire breaks out in the ship's galley, and apart from sounding the general alarm, the Master immediately turns his ship to head to Port Beta, the nearest major port. He is informed that the ship's cook has suffered severe burns, and, at 10:10, he calls for a helicopter to take the cook ashore for treatment.

At Port Beta, a helicopter takes off at 10:30. At that time, the ship is 216 nautical miles from the port and has increased speed to 16 knots. The helicopter flies at 200 nautical miles an hour.

The helicopter puts a medical team aboard the ship, and hovers for 30 minutes while they stabilise the patient and then begins to lift off the patient and the medical team, a process that takes 10 minutes. The helicopter returns to base where an ambulance is waiting to take the patient to hospital.

In the meantime, efforts to extinguish the fire fail, the fire spreads to another part of the accommodation and toxic smoke is emitted. At 12:30, the Master orders the lifeboats to be readied for launching. Two other ships have diverted from their courses to stand by *Corfu* in case her crew has to abandon ship. However, the crew continues to fight the fire and eventually manage to extinguish the fire.

The Master decides to continue to Port Beta so that the full extent of the damage can be assessed, and repairs can be undertaken. At 06:00 on 8 June, *Corfu* arrives off Port Beta, the pilot boards and she berths at 07:10.

Surveyors check the damaged part of the ship, and, in consultation with the owner and insurers, it is agreed that repairs to the ship should be carried out in Port Beta.

After she has been undergoing repairs for two weeks, surveyors clear *Corfu* to resume trading and she sails for Port Alpha.

2.4.1 At what time will the helicopter reach the ship? *Be careful to note all the details of the speed of the ship and of the helicopter.* (6)

2.4.2 When will the helicopter arrive back at its base? (6)

2.4.3 Which type of marine insurance will cover each of the following:

(a) The costs of the helicopter. (2)

(b) The costs of the ship diverting to and staying in Port Beta for two weeks. (2)

(c) The hospital and other medical costs for the ship's cook. (2)

(d) The repairs to the ship. (2)

2.4.4 Which three organisations would have sent surveyors to the ship to inspect the fire damage? (6)

2.4.5 Which two of these three organisations would have to approve her return to trading? (4)

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2.4.6 General Average was declared, and various costs totalled $3.2 million.

(a) Who declares General Average? Choose your answer from:

SHIP'S MASTER or SHIPOWNER or CHARTERER or SHIPPER (2)

(b) Calculate the share of the costs that would have to be paid by the shipowner in terms of General Average. (6)

2.4.7 The carriage of cargo by *Corfu* from Port Omega to Port Alpha is governed by a bill (or bills) of lading. How many bill(s) of lading is/are required for this cargo? (2)

2.4.8 Will the ship be off hire during the diversion to Port Beta? Answer YES or NO. (2)

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QUESTION 3 INTERNATIONAL TRADE

3.1 Write a note on the importance of the Panama Canal in world shipping. Among other facts that you provide in your note, mention the following:

- its position on world trade routes
- why it is a preferred route for many shipowners
- a brief account of the special features that form an important part of the Canal and that enable ships to be moved to a lake that is above sea level and down the other side of the lake
- the important changes that were completed in 2015 that had very positive influence on shipping
- some important cargoes that are moved via the Canal (12)

3.2 The present limits to the size of ships that can pass through the Panama Canal are as follows:

Length	Beam	Draught
370 m	51 m	15 m

3.2.1 Which of the following ships can pass through the Panama Canal fully laden?

Name	***Length***	***Beam***	***Loaded Draught***
Diamond	394 m	54 m	19 m
Ruby	167 m	23 m	11 m
Pearl	360 m	40 m	14 m
Emerald	210 m	29 m	11 m
Garnet	364 m	49 m	15 m
Sapphire	342 m	65 m	18 m

(4)

3.2.2 What term is given to a ship that can pass through the Panama Canal fully laden? (2)

3.3 Give the correct term for each of the following:

3.3.1 The document that governs the conditions under which a ship is chartered. (2)

3.3.2 A list of cargo aboard a ship. (2)

3.3.3 A person or company who arranges to clear cargo from the harbour to the consignee. (2)

3.3.4 A person or company who arranges the sale of a ship on behalf of her owner. (2)

3.3.5 A person or company who arranges a charter on behalf of the shipowner. (2)

3.3.6 A bulk carrier that is 270 m long and has deadweight of 235 000 tons. (2)

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3.3.7 The main product exported via Saldanha Bay. (2)

3.3.8 The type of charter in terms of which the charterer has to appoint the crew, arrange the insurance for the ship, arrange the bunkers and the operation of the ship. (2)

3.3.9 The convergence zone that links the South China Sea to the Indian Ocean. (2)

3.3.10 The largest and busiest port in Europe. (2)

3.3.11 The fee that is charged by a country on many imported goods. (2)

3.3.12 The government department that ensures that the fee (mentioned in Question 3.3.11. above) is paid by the person or company importing the goods. (2)

3.4 A containership has 1200 plug points for refrigerated containers, and a total cargo capacity of 6400 **TEU**. At Cape Town, she arrives with 2420 40-foot dry cargo containers aboard and 410 40-foot refrigerated containers.

3.4.1 What does the term TEU mean? (4)

3.4.2 How many refrigerated containers can she load in Cape Town? (6)

3.5 A consignment of aluminium bars produced at the Omega Alu-smelt smelter in Port Omega will be containerised for export to Chuan Aluminium Products in Port Beta, China. For this purpose, the bars will be placed on pallets and secured to the pallets by plastic strapping and the pallets will then be loaded into 40-foot containers. Each pallet with aluminium bars on it has the following dimensions:

Length 1.8 m Breadth 1.8 m Height 1.8 m

A 40-foot container has the following internal dimensions:

Length 12 m Breadth 2 m Height 2 m

A consignment of 240 pallets with aluminium bars will be shipped from Port Omega to Port Delta in 40-foot containers aboard the containership *Sea Trader*, owned by Sea Container Shipping Company that is managed by Singapore Ship Management Company. The shipment will be arranged by Omega Logistics in Port Omega.

3.5.1 Give two uses of aluminium. (4)

3.5.2 For this consignment of rolled aluminium (described in Question 3.5), which company is …

(a) The carrier (2)

(b) The consignee (2)

(c) The consignor (or shipper) (2)

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3.5.3 How many pallets can fit into one 40-foot container? (6)

3.5.4 How many 40-foot containers will be required for this consignment of 240 pallets? (6)

3.5.5 If the freight rate for each container from Port Omega to Port Beta is $2 800, what did the containership earn for the shipment? (6)

3.5.6 If a port congestion surcharge of $500 per container is imposed by the shipping line, what will be the adjusted revenue earned by the ship? (6)

3.5.7 Why do some companies add a port congestion surcharge to the shipping rate for cargoes? (4)

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QUESTION 4 MARINE ENVIRONMENTAL CHALLENGES

4.1 What effect will an oil spill have on each of the following?

4.1.1 The local fishing industry. (4)

4.1.2 Tourism in the area. (4)

4.2 When *Sea Trader* is five days out of Port Beta in Asia, she received the following weather forecast for the area she was approaching

GALE WARNING +++++ GALE WARNING +++++ GALE WARNING

WIND	SOUTH-WEST, FORCE 12 EXCEEDING 100 KNOTS AT TIMES
SEA	CONFUSED SWELL REACHING 12 METRES AT TIMES
WEATHER	HEAVY RAIN
VISIBILITY	POOR IN THE RAIN

ALL SHIPS ARE ADVISED NOT TO STEAM WITHIN 400 NAUTICAL MILES OF THE EYE OF THE STORM CURRENTLY LOCATED AT POSITION 24º 36' N 135º 05' E AND MOVING NW AT ABOUT 15 KNOTS

4.2.1 What weather system is causing the weather described in this forecast? Note the area in which the system is located. (2)

4.2.2 What is the 'eye' referred to in the weather forecast? (4)

4.2.3 Why are ships advised to keep clear of the weather system? (6)

4.3 Explain why the unregulated discharge of ballast water can result in an environmental problem relating to marine organisms at the port where it is discharged. (4)

4.4 Explain why plastic strapping such as that used to strap the aluminium bars onto pallets for shipment pose dangers to marine life. (4)

4.5 What is the term given to cargoes that cannot be handled in rain? (2)

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Total: 300 marks

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