NATIONAL SENIOR CERTIFICATE EXAMINATION
MAY 2022

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 Before steam engines were used in ships, a vessel trading between Europe and India would have had to rely on two natural sources of power. Name these two sources of power. (4)

1.2 Give two ways in which the change to steam propulsion assisted shipping. (4)

1.3 Apart from some steam turbine vessels, steamships in their various forms have been replaced by the so-called motorship, using a large main engine, or two large main engines. Explain the advantages of this type of engine being used in ships when compared to coal-fired steam engines. (6)

1.4 Read the extract from ***Fin24*** on 22 June 2021, and answer the questions set.

Note:

- Shanghai is in China and Rotterdam in The Netherlands.
- Euro-trading area is the area where the Euro currency is used, i.e. in most European countries. Similar increases apply to containers being shipped from other Asian ports to all areas of Europe.

> Transporting a 40-foot steel container of cargo by sea from Shanghai to Rotterdam now costs a record $10,522, a whopping 547% higher than the seasonal average over the last five years, according to Drewry Shipping. With upwards of 80% of all goods transported by sea, freight-cost surges are threatening to boost the price of everything from toys, furniture and car parts to coffee, sugar and most other household items, compounding concerns in global markets already bracing for accelerating inflation.
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> "In 40 years in toy retailing I have never known such challenging conditions from the point of view of pricing," Gary Grant, the founder and executive chairman of the UK toy shop The Entertainer, said in an interview. He has had to stop importing giant teddy bears from China because their retail price would have had to double to add in higher freight costs. "Will this have an impact on retail prices? My answer has to be yes."
>
> A number of factors – soaring demand for containers, a shortage of containers, congested ports, too few ships and too few dock workers – have contributed to the squeeze on transportation capacity on every trade route. Recent Covid outbreaks in Asian export hubs like China have made matters worse. The pain is felt more on longer-distance routes, making shipping from Shanghai to Rotterdam 67% more expensive than to the US West Coast, for instance. Although still seen as a relatively minor input, a 205% increase in container shipping costs over the past year could raise euro-area producer prices by as much as 2%.

1.4.1 Describe the current trend in container shipping rates between Asia and Europe.

Choose your answer from: UPWARD or DOWNWARD or STEADY or FLUCTUATING or FLUCTUATING REGULARLY. (2)

1.4.2 What effect will the current container rates have on the prices of new cars being built in Britain but using parts from Japan? (2)

1.4.3 Explain your answer to Question 1.4.2. (6)

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1.4.4 How much will it cost to move five 40-foot containers from Shanghai to Rotterdam? (6)

1.4.5 In ***each*** of those five containers are four crates of car parts. What is the freight rate per crate? (6)

1.4.6 The trends described in this extract have affected containership operators.

(a) Give one favourable effect on containership operators. (2)

(b) Give one unfavourable effect on containership operators as mentioned in the extract. (2)

(c) Explain your answer to Question 1.4.6. (b). (2)

1.4.7 Are the current trends in freight rates for containers being felt on trades other than the Asia-Europe trade? Answer YES or NO. (2)

1.4.8 Have the container freight rates been at this level before? Answer YES or NO. (2)

1.4.9 Quote from the extract to support your answer to Question 1.4.8. (2)

1.5 Many shipowners prefer to crew their ships with seafarers from other countries. Give three reasons for this practice. (6)

1.6 Cabotage is the reservation of sea trade for ships registered in a particular country or group of countries. Explain how this system (cabotage) can help to employ seafarers of a country that has introduced cabotage. (6)

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QUESTION 2 SHIPPING OPERATIONS

2.1 Here are some details about the bulk carrier *Nikolas K*:

She has five holds, a bulbous bow, and her accommodation and engine room are aft.

Length		170 metres
Loaded Draught		11 metres
Freeboard when loaded		5 metres
Owner		Karos Shipping, Limassol, Cyprus
Managers		Patris Ship Management, Cyprus
Charterer		Jason Shipping, Bahamas (an island group southwest of Florida, USA) Charter begins at 00:01 on 01 July. She is on a **time charter** for **a maximum of 220 days** during which she is expected to make several laden voyages carrying sugar from Trinidad (an island near the Caribbean Sea) to Rotterdam. She is about to make her first voyage. The charter will end in Rotterdam at 23:59 on the last day of the last laden voyage.
Insurers	H&M	Lloyd's
	P&I	West of England
Port of Registry		Limassol (Cyprus)
Classification Society		Germanischer Lloyd
Cargo		28 800 tons of sugar
Cargo distribution		No 1 Hold 4 800 tons No 2 Hold 5 600 tons No 3 Hold 6 400 tons No 4 Hold 6 400 tons No 5 Hold 5 600 tons Each hold has a crane.
Origin of Cargo		Trinidad Sugar Inc.
Loading port		Port of Spain, Trinidad *(Note that Port of Spain is NOT in Spain, but in Trinidad.)*
Discharge Port		Rotterdam, for onward movement to Dusseldorf by river barge
Destination of Cargo		Zucker Gesellschaft, a sugar refinery in Dusseldorf, Germany
Value of Ship		$52 million
Value of Cargo		$13 million
Value of Bunkers on board		$220 000

2.1.1 Referring to the details given, draw a diagram of this ship from bow to stern, showing all available information about the vessel and her cargo. Show the ship as viewed from the PORT side. (10)

2.1.2 What type of bulk carrier is *Nikolas K*? There are TWO parts to this answer. (4)

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2.1.3 A round voyage includes time in Port of Spain, time at sea, time in Rotterdam, the return voyage, and time at anchor outside Port of Spain. The shipbroker anticipates the following for ***each*** of the vessel's voyages to Rotterdam:

- Time in Port of Spain: 2 days
- Time at sea: Port of Spain to Rotterdam 14 days
- Time in Rotterdam 6 days (including 1 day hold cleaning)
- Time at anchor on return to Port of Spain 2 days

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

(b) If the distance from Port of Spain to Rotterdam is 4032 nautical miles, what speed is *Nikolas K* expected to maintain for the voyage? (6)

(c) How many ***laden*** voyages can *Nikolas K* *complete* within the charter period? (6)

(d) Which hold will determine the length of the ship's stay in Port of Spain? (2)

(e) The anticipated loading rate is 400 tons of sugar per hour. How many hours will the actual loading operation take in Port of Spain? (6)

(f) Breaks in loading total 6 hours. Assume that the agreed laytime is 24 hours, including breaks. Did the loading process take longer than the agreed time? Answer YES or NO. (2)

(g) Which was payable: demurrage or dispatch? (2)

(h) Who would be liable for payment? Choose your answer from: SHIPOWNER or CHARTERER or AGENT (2)

(i) A hurricane is forecast to pass over Port of Spain on 6 July. Will it affect loading on the first voyage of *Nikolas K*? Answer YES or NO. (2)

(j) Explain your answer to Question 2.1.3. (i). (4)

(k) Irrespective of your answers to these questions, why would loading have to stop from several hours before the arrival of the hurricane and only resume several hours after it has passed? (6)

(l) What is the name for a hurricane that is off the coast of China? (2)

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2.1.4 Assume that the cargo was carried FOB (the INCOTERM for free onboard).

Choosing your answers from either SHIPPER or CONSIGNEE, who pays for each of the following?

(a) the costs of loading the cargo of sugar in Port of Spain. (2)

(b) the ocean freight costs between Port of Spain and Rotterdam. (2)

(c) the costs of discharging the cargo in Rotterdam. (2)

2.2

On her last voyage from Port of Spain to Rotterdam, *Nikolas K* suffers a major main engine breakdown in heavy weather off the British coast at 10:30 on 4 February. Because the ship is off a lee shore and a gale force wind is blowing, the Master *immediately* calls for tug assistance as the ship drifts towards the shore. *Two hours* after the breakdown, the Master orders both anchors to be dropped as the ship is getting close to the shore.

Two helicopters from the Royal Air Force are ordered to the scene in case they are needed to evacuate the crew.

A surveyor from the British Maritime Coastguard Agency boards by helicopter.

Operating on a Lloyd's Open Form, the salvage tug *Solent* arrives at the scene at 13:10, manages to connect a towing line, and her Master, in consultation with the Master of *Nikolas K*, decides to tow the disabled bulker to Southampton. Amid a very heavy sea running with some swells exceeding 10 metres, the tug, with *Nikolas K* in tow, arrives at the Southampton pilot station at *18:30 on 4 February*.

As there is no danger that she will sink and no danger of pollution, she is allowed to enter the harbour. The pilot boards *at 19:00* and she berths in Southampton harbour *at 21:10*.

After two weeks in port undergoing major engine repairs, *Nikolas K* resumes her voyage to Rotterdam.

2.2.1 What role is the Maritime Coastguard Agency playing in this incident? (2)

2.2.2 Give two organisations that would have to approve her return to trading. (4)

2.2.3 Who would pay for the repair to the ship's main engine? (2)

2.2.4 The tug owner claims for salvage. Give four reasons that the claim may be successful. (8)

2.2.5 What is the process called where a dispute relating to a salvage claim is settled? (2)

2.2.6 Where are most salvage claim disputes settled? (2)

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2.2.7 Assume that General Average was declared. Who declares General Average?

Choose your answer from:
SHIP'S MASTER or SHIPOWNER or CHARTERER or SHIPPER (2)

2.2.8 In which convergence zone would the ship have been when she suffered the breakdown? (2)

2.2.9 Across which ocean has she steamed from Trinidad? (2)

2.2.10 Which Sea would she have entered after passing through that convergence zone en route to Rotterdam? (2)

2.2.11 In some operations, it becomes clear that the casualty cannot be salvaged easily or quickly. What form of operation may the salvors invoke in such a situation? (2)

2.2.12 You are the master of *Nikolas K*. Write an outline ***in point form*** that will be the basis of your report on the grounding of the ship. The outline should be in the following format:

4 February 2022
10:30 Engine room alarms sounded.
10:35 Chief Engineer informed me that a major problem has arisen in the engine room (He later informed me that a crankcase explosion had occurred, that the ship had been immobilised, and that his engineers would not be able to fix the problem without shoreside assistance.) Fortunately, no one had been injured in the explosion.
XXXX Because we were off a lee shore …

Now continue in this format giving details of other important events given in the text. Continue right up to the time your ship berthed in Southampton. Ensure that you use the dates and times given in the text above and remember to include reference to the weather conditions. (14)

2.3 A learner in a South African school completes Grade 12 with good passes in Mathematics and Physical Science as two of his subjects. He wishes to start a career as a Navigating Officer in the **Merchant Navy** aboard containerships, tankers or bulk carriers.

2.3.1 Where must he study for a year before he will be employed as a Navigating Cadet? (2)

2.3.2 Once he is at sea, he completes his seatime, passes oral examinations and returns to sea as a watchkeeping officer aboard a bulk carrier.

(a) Which South African organisation would conduct his oral examinations? (2)

(b) What will be his rank when he is aboard his first ship as a fully qualified watch-keeper? (2)

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2.3.3 He completes further courses, passes more examinations for the highest certificate of competency, and gains much sea-going experience. What is the highest rank to which he can be promoted on a ship? (2)

2.3.4 How many navigating officers are usually employed on a large bulk carrier? (2)

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QUESTION 3 INTERNATIONAL TRADE

3.1 Read the extract from *Cape Times* of 31 March 2021 and answer the questions set.

Note: When the containership Ever Given *blocked the Suez Canal, hundreds of ships queued at both ends of the canal waiting to pass through. Once* Ever Given *had been refloated, the delayed vessels could pass through the canal.*

Grounding highlights the vulnerability of Suez Route

The length of four rugby fields, nearly 50 metres high with 11 tiers of containers on the foredeck and over 12 tiers in places in the midships section and down aft, very little space on each side when transiting the canal, thousands of tons of heavy fuel in her bunker tanks, and a strong wind on the beam. That was the scenario when the almost fully-laden *Ever Given* entered the Suez Canal at about 10 knots en route from China to Europe last week.

Imagine the windage on that enormous ship, and imagine her momentum when something went wrong, her stern touched the port side of the canal, and she ploughed into the starboard bank. That her propellers and rudder escaped damage is a miracle.

Of immediate concern was the fact that her bow was resting on one bank and the stern on the other, creating enormous stresses on the hull that would have been subjected to the even small rise and fall of the tide … It was indeed fortunate that she did not fracture amidships.

Several factories and assembly lines rely on consignments of parts arriving "just in time" for their manufacturing processes, with containerships being regarded as floating, moving warehouses for the requisite parts. Thus, any delay to containerships – such as that caused by the lengthy hold-up at the Suez Canal – jeopardised the smooth operation of these factories. A motor assembly plant in Britain, for example, would have had parts from Japan, Korea or China aboard several of the containerships that were delayed in berthing in British ports.

Once she was refloated on Monday afternoon following the persistent and laudable efforts of Egyptian, Dutch and Japanese officers, the rush of [other] ships to their discharge ports will lead to congestion at European ports or Asian ports such as Singapore, engendering further delays. And in the case of these mega-containerships, only a few ports are equipped to handle them, increasing the chance of congestion.

In time, the cause of the *Ever Given* incident will be determined, and no doubt remedies will be sought to prevent a recurrence. The Canal Authority will need to review the procedures for large ships transiting the canal. Perhaps ships over a certain length and/or with high windage should have tugs made fast for the duration of the canal transit, a solution that will cost money and that will need umpteen tugs …

Responding to the *Ever Given* incident, underwriters may impose insurance surcharges for larger ships transiting the canal. After all, with their loads of thousands of containers carrying mega-million-dollar cargoes, or tankers carrying millions of barrels of oil, they pose larger risks, not only for loss of the ship and extremely valuable cargo, but also for blocking the canal.

3.1.1 The passage of these large containerships through the Suez Canal has been described as "an accident waiting to happen". List four characteristics of ships like *Ever Given* that could cause an accident in the canal. (8)

3.1.2 Give four possible consequences of the canal being blocked like this. (8)

3.1.3 The canal was closed on two previous occasions because of a war in the region. What was the effect of the closures on each of the following?

(a) Bunker services at Port Said at the northern end of the canal (4)

(b) South African ports (4)

(c) Ships on passage from India to Europe (4)

3.1.4 Why did the closure of the Suez Canal due to the blockage by *Ever Given* not affect global shipping in the same way as those other two closures of the canal? (4)

3.1.5 Which two seas does the Suez Canal link? (4)

3.2 The Panama Canal provides a shorter route for ships trading between the west coast of North America and the east coast of North America.

3.2.1 Name one major port on the east coast of North America. (2)

3.2.2 Name one major port on the west coast of North America. (2)

3.2.3 Describe the route a ship would have taken when steaming from the west coast of North America to the east coast of North America before the Panama Canal was opened. (4)

3.2.4 Larger sets of locks were completed in 2015 and allow larger ships to pass through the Panama Canal. How will this help the worldwide shipping industry? In your answer, refer to some of the types of ships that will be able to pass through the canal, to the types of cargoes that those ships will carry, and to some of the countries that will gain from the enlarged canal. (10)

3.3 A Flag State Control authority plays a major part in international shipping.

3.3.1 List FIVE functions of a Flag State Control organisation such as the United States Coastguard. (10)

3.3.2 Which organisation is the South African Flag state control? (2)

3.3.3 The Australian port state control organisation finds that a Panamanian ship is overloaded before she sails from Sydney.

(a) How would they know that the ship is overloaded? (2)

(b) What would the Australian authority do about this problem? (THREE parts to the answer) (6)

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3.4 Which organisation …

3.4.1 is the international controlling body for shipping? (2)

3.4.2 would act against a ship that is deliberately causing oil pollution off the South African coast? (2)

3.4.3 is responsible for the registration of South African ships? (2)

3.4.4 places ships in class? (2)

3.5 South African territorial waters extend 12 nautical miles from the major points along the coast. Although all ships have the right of innocent passage through any country's territorial waters, South Africa can take action against ships that contravene international maritime law in that area. Can South Africa intervene in each of the following incidents? Answer YES or NO to each question.

3.5.1 A ship is five nautical miles off Cape Point and known to be carrying illegal weapons. (2)

3.5.2 A ship is carrying legal nuclear waste in special radiation-proof containers and is passing five miles off Cape Agulhas en route from France to Japan. (2)

3.6 In terms of international law, the STCW 95/2011 convention is important in matters to do with crewing. Indicate whether STCW 95/2011 covers each of the following: Answer YES or NO.

3.6.1 The prescribed minimum number of seafarers on a ship. (2)

3.6.2 The examinations set by a training institution for candidates for chief engineers' certificates of competency. (2)

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QUESTION 4 MARINE ENVIRONMENTAL CHALLENGES

4.1 Explain why tankers carrying crude oil or other petroleum products need to be double-skinned. (4)

4.2 Plastic has become a major pollutant in the oceans.

4.2.1 What is the major source of this plastic? Choose your answer from LAND or SHIPS. (2)

4.2.2 Explain why plastics in the sea present particularly serious problems. (6)

4.3 How would a gale force south-easterly wind affect each of the following:

4.3.1 operations within a harbour (6)

4.3.2 ships steaming on a south-easterly course (4)

4.4 A mid-latitude cyclone (depression) will move through an area during the next 24 hours. How will the weather change during this time? *(Refer to temperature changes, changes in wind strength and direction, and any rain that might accompany such a weather system.)* (8)

[30]

Total: 300 marks

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