



NATIONAL SENIOR CERTIFICATE EXAMINATION  
NOVEMBER 2019

## MARITIME ECONOMICS

Time: 3 hours

300 marks

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### PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 15 pages, an Answer Sheet of 1 page, and an Addendum of 1 page (i). Please check that your question paper is complete.
  2. Please write your examination number in the blocks provided on the Answer Sheet. Remember to hand in this sheet.
  3. Read the questions carefully before answering.
  4. Answer all questions.
  5. Answer the questions in the order that they appear on the question paper.
  6. Show all working where calculations are involved.
  7. It is in your own interests to write legibly and to present your work neatly.
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**QUESTION 1      MULTIPLE CHOICE QUESTIONS**

Answer these questions on the Answer Sheet provided by marking the block corresponding to your answer with an "X".

- 1.1 Shipowners are being forced to ensure that devices are fitted to their ships' exhaust flues to reduce ...
- A exhaust fumes being emitted
  - B exhaust smells being emitted
  - C carbon being emitted
  - D nitrogen being emitted
- 1.2 How many navigating officers are usually assigned to a large containership?
- A Two
  - B Three
  - C Four
  - D Five
- 1.3 From the list below, the country providing most merchant seafarers is ...
- A South Africa
  - B India
  - C Norway
  - D Brazil
- 1.4 A ship is registered in Malta but is owned by a Norwegian company. The term for Malta in this situation is ...
- A an out-flag
  - B a flag of convenience
  - C a hub flag
  - D a flag of influence
- 1.5 The organisation that will declare a ship seaworthy after an accident is ...
- A Shipowners' Association
  - B P & I Club
  - C Lloyd's Association
  - D Flag State Control
- 1.6 A tanker sails from Kuwait in the north-western part of the Arabian Gulf to Saldanha Bay. Through which of the following will she pass?
- A Southern Ocean
  - B Straits of Hormuz
  - C Straits of Gibraltar
  - D Straits of Malacca

- 1.7 What type of insurance would cover the loss of a container at sea?
- A TT Club
  - B FFO
  - C P & I Club
  - D Hull & Machinery
- 1.8 What type of insurance would cover damage to a ship resulting from a fire?
- A TT Club
  - B FFO
  - C P & I Club
  - D Hull & Machinery
- 1.9 A ship has suffered a serious breakdown in her main engine. What type of insurance would cover the costs of chartering a tug to tow her into port?
- A TT Club
  - B FFO
  - C P & I Club
  - D Hull & Machinery
- 1.10 What type of insurance would cover water damage to a cargo of grain when it is found that the ship's hatch cover was leaking?
- A Cargo Insurance
  - B FFO
  - C P & I Club
  - D Hull & Machinery
- 1.11 The term that applies to the process of settling a dispute between a charterer and a shipowner is known as ...
- A litigation
  - B Charter Party Review
  - C jurisdiction
  - D arbitration
- 1.12 A south-westerly wind of constant speed and blowing in the north-western part of the Indian Ocean in the northern hemisphere's summer months is known as a ...
- A hurricane
  - B typhoon
  - C mid-latitude cyclone
  - D monsoon
- 1.13 Between the Gulf of Aden and the Suez Canal lies the ...
- A Strait of Hormuz
  - B Strait of Malacca
  - C Red Sea
  - D Arabian Sea

- 1.14 The Incoterm that indicates that the costs of carrying the cargo (from after it crosses over the ship's gunwale) until it reaches the consignee's premises will be paid by the consignee.
- A FOB
  - B FAS
  - C CIF
  - D DDP
- 1.15 The Incoterm that indicates that the costs of shipping cargo from the shipper's (consignor's) premises to the consignee's premises will be paid by the consignee.
- A FOB
  - B FAS
  - C EXW
  - D DDP
- 1.16 Who bears the shipping freight charges on the ocean leg of the transport chain if cargo is shipped EXW (Ex Works)?
- A The shipper
  - B The consignee
  - C The carrier
  - D The forwarding agent
- 1.17 The document that sets out the conditions of the carriage of goods by sea is called the ...
- A Charter Party
  - B Bill of Lading
  - C Cargo Manifest
  - D Mate's Receipt
- 1.18 A cruise ship was delayed by heavy weather and a number of passengers missed their flights from the next port where the ship called. Who would have paid the cancellation fees and the rebooking fees for new flights for these passengers?
- A The cruise ship owner
  - B The travel agent who booked the passengers' passage aboard the ship
  - C The ship's P & I Club
  - D The Classification Society
- 1.19 The primary cause of occasionally very rough seas off Mauritius for a few days in March is a ...
- A mid-latitude cyclone
  - B tropical cyclone
  - C south-west monsoon
  - D north-east monsoon

- 1.20 The apex predator in the marine food chain is the ...
- A blue whale
  - B great white shark
  - C leopard seal
  - D orca
- 1.21 The main problem caused by an oil spill in mid-ocean is that ...
- A it kills dolphins
  - B it kills phytoplankton
  - C it kills seabirds
  - D it might destroy the fishing industry
- 1.22 An international code in terms of which ships must be crewed properly is ...
- A SOLAS
  - B STCW 95/2010
  - C ISM
  - D ISPS
- 1.23 If a ship loads 180 400 tons of iron ore, her deadweight is likely to be ...
- A 180 400 tons
  - B 174 400 tons
  - C 187 400 tons
  - D 197 400 tons
- 1.24 The label that will appear on a ship's crane that can lift 40 tons is ...
- A SLW 40
  - B SWL 40
  - C SWL 40 tons
  - D SLW 40 tons
- 1.25 The country in which a ship is registered is known as the ...
- A Port State
  - B Flag State
  - C Ship State
  - D Home State
- 1.26 The country with the largest ships' register is ...
- A China
  - B Philippines
  - C Panama
  - D Liberia

- 1.27 A country that allows only ships registered in its ports to move cargoes between its ports has a policy that is known as ...
- A local portage
  - B lighterage
  - C cabotage
  - D local carriage
- 1.28 A ship steaming from East London to Maputo will ...
- A steam against the Benguela Current
  - B steam against the Agulhas Current
  - C steam with the Agulhas Current
  - D steam with the Benguela Current
- 1.29 Conditions associated with a monsoon may affect shipping in the ...
- A Arabian Sea
  - B Caribbean Sea
  - C Tasman Sea
  - D Red Sea
- 1.30 Conditions associated with a mid-latitude cyclone may affect shipping near ...
- A Trinidad (Caribbean Sea)
  - B New Orleans (US Gulf)
  - C Shanghai (China)
  - D Tasmania (Australia)

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**QUESTION 2 THE MARITIME WORLD**

- 2.1 Give two reasons for ships operating within polar areas having to use gas oil for their main engines, rather than heavy fuel oil. (4)
- 2.2 Why is nuclear fuel not a viable option for the propulsion of commercial ships? (4)
- 2.3 Give the best form of propulsion (azipods *or* conventional propeller *or* multi-directional propulsion *or* dynamic positioning system *or* wind propulsion) for the following vessels:
- 2.3.1 a harbour tug. (2)
- 2.3.2 a large, deep-draughted tanker requiring a service speed of around 13 knots. (2)
- 2.3.3 a large cruise ship calling regularly in small harbours and anchorages around the Caribbean islands. (2)
- 2.3.4 a drill ship that must remain in a particular position for a long time. (2)
- 2.4 Read the following extract from the Cape Times and answer the questions set:

While nearing the end of a cruise along the Norwegian coast and with 1 373 people on board, the ship, Viking Sky, simply had something go terribly wrong – perhaps a main-board electrical failure in her diesel-electric power system, or perhaps fuel issues – the details of which were not to hand at the time of writing.

Several factors contributed to the happy ending for what could have been an awful disaster. The well-found vessel was fairly new, and was owned and operated by a reputable company. From the brief footage on television and, despite the violence of the eight-metre swell that caused furniture to be flung across the deck of the public rooms, the passengers seemed to have been mustered in an orderly way, something that would only have been possible with experienced and well-trained officers and crew on board.

Fortunately, her complement was nowhere near the 6 000 passengers and some 2 500 crew who could be aboard some of the mega-ships that are now entering service. Many point to the dire risk of mass casualties posed by these huge ships and their extensive passenger lists when a problem arises.

That the incident occurred within the jurisdiction of a highly competent and well-equipped coastguard was reassuring. Within minutes of the mayday call being issued, five helicopters were being scrambled; medical teams were rushing to various locations to treat the injured, while tugs were putting to sea to assist. Other vessels were diverting to stand by in case they were needed as landing platforms for those being evacuated by helicopter.

The experience and skill of the intrepid helicopter pilots and the flight crews in operating their aircraft and personnel winches, with the wind gusting at about 40 knots and the vessel rolling violently, were noteworthy, and the helicopters managed to lift hundreds of passengers to safety.

This was a maritime drama in the extreme – highly dangerous conditions, a ship in trouble, and an inhospitable coast to leeward. In the end, the experience, training and frenetic work by the vessel's engineers restored power – we need some of those folks here! – enabling the ship to get underway and edge away from the coast and finally to enter harbour.

A different but very possible scenario would certainly have had a different ending. Imagine a large ship with thousands of people aboard – too many to be hauled off by helicopter – being disabled along a coast without the resources that were available to the Norwegians. The weather may have deteriorated further.

Worse, she could have been disabled in heavy weather in mid-Atlantic – with a fire on board, necessitating the evacuation of passengers and crew. While maritime authorities continue to allow the construction of these huge ships, a mid-Atlantic evacuation is a real-life horror story that can easily happen.

- 2.4.1 Off which coast did this incident happen? (2)
- 2.4.2 What is a mayday call? (2)
- 2.4.3 Why were the local authorities able to manage this incident well, with no casualties? (6)
- 2.4.4 Explain why it would be far more serious if a larger cruise ship had to be abandoned in mid-ocean in rough seas? (6)
- 2.4.5 Assume that 4 200 passengers and crew need to be evacuated from a cruise ship *Sunrise* in mid-ocean. Two ships arrive at the scene to give assistance:
- |                          |   |
|--------------------------|---|
| <i>Ocean Pilot</i>       | 300-metre Capesize bulk carrier in ballast  |
| <i>President Mandela</i> | Frigate (warship of 130 metres) with a helicopter on board and a helicopter landing pad on the after deck |
- (a) Explain the difficulties that *Ocean Pilot* would encounter rescuing passengers from *Sunrise*. (4)
- (b) What is the main advantage that *President Mandela* offers to the rescue efforts? (2)
- (c) Working together, how could the bulk carrier and the warship manage to rescue many of the passengers? (Think of the size of the bulker and your answer to Question 2.4.5 (b).) (6)
- 2.5 Most Norwegian-owned ships used to have Norwegian crews. Nowadays, few Norwegian-owned ships are flagged in Norway and few carry Norwegian crews. Explain why few Norwegian-owned ships are flagged in Norway these days. (6)

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**QUESTION 3 SHIPPING OPERATIONS**

3.1 The following message was received by Cedar Shipping Agency (in Vancouver on the west coast of Canada), the port agents for the *Pacific Trader*.

ETA PILOT STATION VANCOUVER 06:00 13/06. LAST PORT SHANGHAI, CHINA. PREVIOUS PORTS: AUCKLAND, SINGAPORE, KUWAIT, ROTTERDAM, SAFI, TARRAGONA, LA PLATA, ANTWERP, MONTREAL. DRAUGHT FORWARD 12 METRES AFT 12,5 METRES. BALLAST WATER EXCHANGED AS REQUIRED. THIRD MATE GONSALVES SIGNING OFF LEAVE. REPATRIATION TO MANILA, PHILIPPINES. ASSUME REPLACEMENT JOINING ON ARRIVAL. PLEASE ARRANGE DOCTOR FOR STEWARD GOMEZ – SUSPECTED BROKEN FINGER. REQUIRE BUNKERS AS FOLLOWS: 850 TONS HFO AND 130 TONS GASOIL. NEXT PORT: SEATTLE, USA, TO LOAD STEEL FOR BUENOS ARGENTINA

CARGO MANIFEST AS FOLLOWS :

1 HATCH: 6 300 TONS RICE  
 2 HATCH: 8 100 TONS RICE  
 3 HATCH: 9 000 TONS RICE  
 4 HATCH: 9 900 TONS RICE  
 5 HATCH: 8 100 TONS RICE

DISCHARGING ROTATION (SEQUENCE) ASSUMING THAT 2 DISCHARGING UNITS ARE TO BE USED:

4 HATCH 9 900 TONS SIMULTANEOUSLY\* WITH 2 HATCH 8 100 TONS  
 THEN

5 HATCH 8 100 TONS SIMULTANEOUSLY WITH 3 HATCH 9 000 TONS  
 THEN

1 HATCH 6 300 TONS USING ONE DISCHARGING UNIT AFTER COMPLETION OF CARGO IN HATCH 3.

PLEASE ENSURE THAT THE VARIOUS SURVEYORS MEET THE SHIP ON ARRIVAL.

MENDOZA, MASTER PACIFIC TRADER

\*simultaneously – at the same time.

- 3.1.1 Explain the reasons for the sequence of discharging the cargo as given by the ship's master. (6)
- 3.1.2 Whom will the surveyors represent? (4)
- 3.1.3 What is the term for the list of cargo aboard a ship? (2)
- 3.1.4 How many previous ports has the master given in this message? (2)
- 3.1.5 In terms of which IMO Code has this list of ports been provided? (2)

3.1.6 *Pacific Trader* berths three hours after arrival at the pilot station. Customs and immigration clearances of the ship take one hour and a meeting regarding the discharging of the ship takes one hour. She begins discharging one hour after the meeting ends. The rate of discharge of the rice cargo is 900 tons per hour per discharging unit. During the entire discharging operation, breaks (tea, meals, changes of shift) total six hours. When is the discharge of the entire rice cargo scheduled to end? (Note the sequence of discharge.) (8)

3.1.7 While discharging No 1 Hatch, the discharging unit breaks down. The second one replaces it. The change-over takes one hour. She shifts to another berth (the manoeuvre takes three hours) where hold-cleaning takes place and takes 26 hours. She is expected to sail four hours after hold-cleaning has finished. What is *Pacific Trader's* ETD from Vancouver? (Note details given in Question 3.1.6.) (6)

3.1.8 List three companies or organisations that will appear on the disbursement account that will be compiled by the agent after *Pacific Trader* has sailed from Vancouver. (6)

3.2 On leaving Vancouver, *Pacific Trader* will steam to Seattle (USA) to load steel for Buenos Aires, Argentina, at an expected average speed of 15 knots. Study the voyage distances provided below, and the map that is Addendum 1.

- The Magellan Straits has to be navigated very carefully and fog is often encountered, forcing ships to reduce speed. Pilotage is compulsory for ships passing through the straits and pilotage fees have to be paid.
- A ship wishing to transit the Panama Canal will need to allocate an extra day for the passage and the canal tariff will have to be paid.

<i>Route</i>	<i>Distance</i>
Via Magellan Straits	8 640 nautical miles (including the passage through the Magellan Straits)
Via Panama Canal	9 360 nautical miles (including the passage through the Panama Canal)

Now answer the following questions.

3.2.1 Why will the charterer want *Pacific Trader* to steam via the Magellan Straits? (4)

3.2.2 As *Pacific Trader* approaches the Straits of Magellan, she encounters thick fog and *for three days*, including the passage through the straits, she steams at 10 knots. **(N.B. Check EACH answer THOROUGHLY as each answer provides an important figure for the next calculation.)**

(a) How many nautical miles will she steam during those three days while she is steaming at 10 knots? (6)

- (b) How many days is the voyage from Seattle to Buenos Aires expected to take? (Remember to include the time she was steaming more slowly in fog.) (6)
- (c) She is expected to use 42 tons of heavy fuel a day at sea. How much heavy fuel is she expected to consume during the voyage from Seattle to Buenos Aires? (6)
- (d) If heavy fuel costs \$321 per ton, what is the expected cost of the heavy fuel used during the voyage from Seattle to Buenos Aires? (6)
- (e) If *Pacific Trader* had taken a full stem of heavy fuel in Seattle (2710 tons), how much fuel is she expected to have left when she arrives in Buenos Aires? (6)
- (f) What is one word for the term **ship's fuel**? (2)

3.3 Study the details given below, including the ship's cargo manifest for the voyage from Seattle to Buenos Aires. All the steel was produced by the Bethlehem Steel Corporation, Seattle, but the rolled steel is owned by and destined for BA Stelios Companhia, Buenos Aires; the steel plating, the steel rods and the steel girders are owned by and destined for Angelos Construzione, Buenos Aires.

**CARGO MANIFEST: PACIFIC TRADER  
VOYAGE SEATTLE (USA) – BUENOS AIRES (ARGENTINA)**

HOLD	CARGO	TONNAGE	VALUE (US\$)
No 1	Steel Plating	2 600	230 000
No 2	Rolled Steel	4 200	610 000
No 3	Steel Rods	5 100	360 000
No 4	Steel Girders	4 900	550 000
No 5	Rolled Steel	4 800	440 000

Bunkers on board: 1 200 tons HVF (Value \$385 200); 350 tons MDO (Value \$175 000).

**NB: All bunkers on board are owned by the shipowner.**

- 3.3.1 How many Bills of Lading will be issued for this voyage? (2)
- 3.3.2 Referring to **this voyage**, give two pieces of information that will be shown on the front of a Bill of Lading. (4)

3.3.3 As *Pacific Trader* clears through the eastern end of the Magellan Straits at 10:00 on 25 July, she grounds on a reef, and is holed. Water enters Number 1 Hold. The vessel is stuck on the reef and tug assistance is required. The salvage tug *Gaucha* arrives four hours later, and the salvors decide to wait for the spring high-tide the following day before attempting to refloat the ship. To lighten the ship, they also decide to jettison the steel plating cargo in Number 1 Hold, i.e. the steel plating cargo was thrown overboard.

EXTRACTS FROM TIDE TABLE – MAGELLAN STRAITS (PILOT STATION – EASTERN END)

	TIME	WATER DEPTH (m)		TIME	WATER DEPTH (m)	TIME	WATER DEPTH (m)
25/07	0800	27.09	26/07	0001	25.01	1600	26.23
	1000	26.34		0200	23.24	1800	28.15
	1200	25.62		0400	25.10	2000	29.43
	1400	24.23		0600	26.29	2200	27.45
	1600	25.43		0800	28.42	2359	26.02
	1800	26.65		1000	26.54		
	2000	27.94		1200	24.41		
	2200	26.23		1400	25.03		

EXTRACT FROM WEATHER REPORT FOR THE PERIOD OF THE SALVAGE OPERATION

WIND	WESTERLY TO SOUTH-WEST, 15 KNOTS, STRENGTHENING LATER TO 30 KNOTS GUSTING TO 45 KNOTS
SEA STATE	WESTERLY TO SW SWELL, 2 TO 3 METRES, BECOMING 5 TO 8 METRES LATER
VISIBILITY	POOR IN THE FOG, CLEARING LATER
WEATHER	OCCASIONAL LIGHT RAIN, BECOMING HEAVIER LATER

- (a) What will be the best time to attempt to refloat the ship? (2)
- (b) What agreement would the salvage tug owner have negotiated with the ship's owners for this operation? (2)

3.3.4 The refloating attempt was successful. Surveyors inspected the vessel and decided that she could continue her voyage to Buenos Aires (at reduced speed) but that the tug would have to escort her.

- (a) Which insurers would have sent surveyors to inspect the vessel? (6)
- (b) The tug owners submit a claim for salvage. Do you think that claim will be successful? Answer YES or NO. (2)
- (c) Give two reasons for your answer to Question 3.3.4 (b). (4)

3.3.5 General Average is declared following the grounding of *Pacific Trader* whose value is \$52 000 000. All the costs (including the loss of the cargo in Number 1 Hold, repairs, and tug's charges) total \$7 320 000. What was the contribution that Angelos Construzione will need to make in terms of General Average? (*You will need to use information given in the introduction to Question 3.3.*)

(6)  
**[100]**

**QUESTION 4 IS ON THE NEXT PAGE**

**QUESTION 4      INTERNATIONAL MARITIME TRADE**

A motor car manufacturer decided to establish a large motor car assembly plant at Port A. They estimate that about 3 000 cars will be manufactured every month, and large numbers of containers with car parts will be landed in Port A from Korea. Tyres will be made at an existing tyre factory in Port B, 450 nautical miles along the coast from Port A and will be brought to Port A by containerships. Steel for the cars will be made at an inland steel mill 320 kilometres from Port A and will be railed to the new car assembly plant. The manufacturer expects that about 2 000 cars will be exported by ship via Port A every month.

- 4.1 Explain how shipping operations in Port A will be affected by the development of the new car assembly plant. (10)
- 4.2 Tyres will come from Port B.
- 4.2.1 If 3 000 cars are built at the new plant every month, how many tyres will need to be brought to Port A every month? (Be careful and remember how many tyres every car will need.) (6)
- 4.2.2 If 300 tyres can fit into one 40-foot container, how many containers will be needed to transport these tyres every month? (6)
- 4.2.3 Would you charter a ship to move these tyres from Port B to Port A? Answer YES or NO. (2)
- 4.2.4 Explain your answer to Question 4.2.3. (4)
- 4.2.5 List the **two** most important contributions – apart from its influence on shipping – that the new motor assembly plant will make to the economy of the area around Port A. (4)
- 4.2.6 List three important changes the port will need to make before the car assembly plant begins operation. (6)
- 4.3 The Korean car parts will be brought by containerships that will pass through the Straits of Malacca.
- 4.3.1 Explain why the Straits of Malacca is so important in global shipping. (6)
- 4.3.2 Give the term or place described in each of the questions below:
- (a) The large port that is situated at the southern end of the straits. (2)
- (b) The sea or ocean into which a ship will steam if she passes through the straits in a north-westerly direction. (2)
- (c) The sea or ocean into which a ship will steam once she has passed the large port (referred to in Question 4.3.2 (a)) and continues towards Japan. (2)
- (d) The important bulk liquid commodity that passes through the Straits of Malacca every day. (2)

- (e) A frozen commodity that would be in a reefer container aboard a ship that is passing through the straits and on a service between Australia and Europe. (2)
- 4.4 Plastic pollution of the sea is a major issue.
- 4.4.1 Give two reasons for plastic being a major pollutant of the sea. (4)
- 4.4.2 What is the major source of the plastic that is found in the sea? (2)
- 4.5 Which International Maritime Code or Convention deals with each of the following?
- 4.5.1 The regulations that govern dumping of waste from ships. (2)
- 4.5.2 The content of the syllabus that has to be taught to navigating cadets before they go to sea. (2)
- 4.5.3 The regulations governing lifejackets used on ships. (2)
- 4.5.4 The regulations that govern security systems being applied to ports and ships. (2)
- 4.5.5 The regulations that apply to marine oil pollution. (2)
- [70]**

## QUESTION 5 MARITIME ENVIRONMENTAL CHALLENGES

- 5.1 Before his ship arrived in Vancouver, the master of *Pacific Trader* indicated that ballast water had been exchanged as required. Explain the term ballast water exchange, and explain why this process is necessary *in terms of where this ship has come from*. (See the introduction to Question 3.1.) (6)
- 5.2 When his ship was off the coast of Chile and heading for the Magellan Straits, the Master of *Pacific Trader* notes from the synoptic chart that a mid-latitude cyclone (a depression) and its associated cold front are approaching from the west and will affect the passage of the ship within the next 24 hours. What effect will this have on each of the following:
- 5.2.1 the wind strength in the area? (2)
- 5.2.2 the swell? (2)
- 5.2.3 container operations in a nearby port? (2)
- 5.3 Explain why fishing quotas have been introduced for South African commercial fishing companies. (8)
- [20]**

**Total: 300 marks**