



NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2019

NAUTICAL SCIENCE: PAPER II

Time: 3 hours

150 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 6 pages. Please check that your question paper is complete.
2. Answer **ALL** the questions in Sections A, B and C.
3. Begin the answer to each new question on a new page.
4. The use of scientific calculators is permitted.
5. Alphanumeric calculators and dictionaries are **NOT** permitted.
6. Nautical tables may be used.
7. It is in your own interest to write legibly and to present your work neatly.

REQUIREMENTS

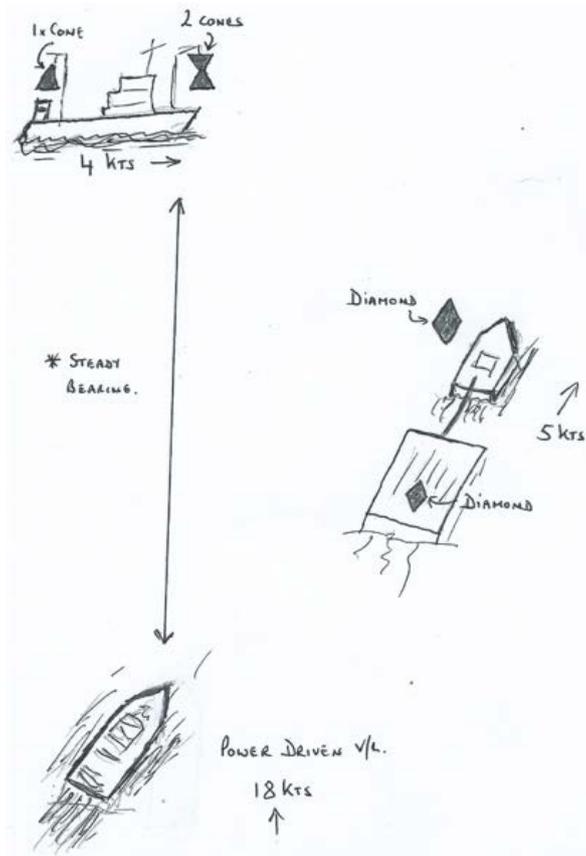
Drawing instruments
Radar plotting sheet

ANNEXURES – Nil

SECTION A SEAMANSHIP

QUESTION 1

1.1 The three power-driven vessels depicted in the sketch below are navigating in clear visibility and in close proximity to each other. There is a risk of collision.



1.1.1 Identify the day signals displayed and the meaning of each one. (6)

1.1.2 What is the responsibility of each of the vessels so as to comply with the International Regulations for Preventing Collisions at Sea 1972 (as amended)? (9)

1.2 What are the fog signals of the following vessels that are making their way in restricted visibility:

1.2.1 a tug towing a manned vessel? (4)

1.2.2 a power-driven vessel? (2)

1.2.3 a trawler engaged in fishing? (2)

1.3 Draw the lights displayed by a laden tanker underway constrained by her draught in a restricted sea area viewed from astern. (3)

1.4 What are the four manoeuvring sound signals of a power-driven vessel in clear visibility? Define the meaning of each signal. (4)

[30]

QUESTION 2

List ten action points to be taken on the bridge of a ship when a person falls overboard whilst underway during the daytime.

Your answer must prioritise the most urgent actions.

[10]**QUESTION 3**

3.1 Sketch a vessel in cross section showing it with a starboard heel.

3.1.1 Stable equilibrium (+GM); (5)

3.1.2 Unstable equilibrium (-GM); (5)

3.1.3 Neutral equilibrium (\emptyset GM). (5)

Show the keel position, centre of buoyancy, centre of gravity and metacentre of the vessel in each of the sketches above.

3.2 What makes a ship "heel" to starboard? (1)

3.3 What makes a ship "list" to port? (1)

3.4 Define "Gross tonnage". (3)

[20]**QUESTION 4**

Your vessel is steering a course 163° (T) at a reduced speed of 5 knots due to poor visibility of less than 1 000 m. You detect a radar target astern that you have been plotting with the following bearings and ranges:

TIME	BEARING	RANGE
20h00	255° (T)	10,0 M
20h10	255° (T)	8,0 M
20h20	255° (T)	6,0 M
20h30	255° (T)	4,0 M

4.1 Plot the target's movements on the plotting sheet provided. (5)

4.2 Prepare a full target report. (10)

4.3 What action would you take to avoid collision with this target? (5)

[20]

QUESTION 5

5.1 What are the design features of a Ro-Ro ship? (5)

5.2 What is a Reefer vessel? (5)

[10]

90 marks

SECTION B COMMUNICATIONS AND METEOROLOGY**QUESTION 6**

- 6.1 In the GMDSS what is Sea Area A1? (3)
- 6.2 Describe the signal you would transmit if your vessel named "Astor" with call sign ZSAR was in distress having grounded on the north-west side of Dassen Island. You are requiring immediate assistance. The weather conditions are observed as wind NW force 7 and poor visibility. (12)
- [15]**

QUESTION 7

Sketch the following isobaric pressure systems and illustrate on each one the isobaric pressure for each gradient and the wind direction for the Southern Hemisphere.

- 7.1 A depression. (5)
- 7.2 An anticyclone. (5)
- 7.3 A high-pressure ridge. (5)
- 7.4 A low-pressure trough. (5)
- [20]**

35 marks

SECTION C SAILINGS**QUESTION 8**

A vessel on a voyage from Cape Town to the Caribbean calculates Noon position on 13 February to be at Lat. $31^{\circ} 06'$ S Long. $013^{\circ} 35'$ E. Ship's time is GMT + 1.

The next WP is Lat. $18^{\circ} 55'$ N Long. $063^{\circ} 25'$ W (GMT – 4).

Lat. $31^{\circ} 06'$	Meridional Parts	1952.93
Lat. $18^{\circ} 55'$	Meridional Parts	1148.62

- 8.1 Calculate the course to steer to the WP. (10)
- 8.2 Calculate the distance to go to the WP. (10)
- 8.3 What is the ETA at the WP at 18 knots? (5)
- [25]**

25 marks

Total: 150 marks