



NATIONAL SENIOR CERTIFICATE EXAMINATION  
NOVEMBER 2023

## NAUTICAL SCIENCE: PAPER II

Time: 3 hours

150 marks

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### 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.
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### REQUIREMENTS

Drawing instruments  
Radar plotting sheet

**SECTION A SEAMANSHIP****QUESTION 1**

The following questions are to be answered in terms of the International Regulations for Preventing Collisions at Sea, 1972, and as amended (COLREGS).

- 1.1 What action should a sailing vessel take, having sighted a tug with tow displaying the day signals indicating that it is severely restricted in ability to manoeuvre? The tug is on a steady bearing two points off the port bow of the sailing vessel. (5)
- 1.2 Describe and illustrate the day signals displayed by a tug and its tow when the length of the tow exceeds 200 metres, and the towing vessel is severely restricted in ability to manoeuvre. (10)
- 1.3 What do the following terms mean:
- 1.3.1 'sailing vessel'? (2)
- 1.3.2 'vessel engaged in fishing'? (8)
- 1.4 When two vessels are in sight of one another and the one sounds five short and rapid blasts on the whistle, what does this signal mean? (5)
- [30]**

**QUESTION 2**

What preparations should a rescue vessel make on board while searching for and expecting to recover survivors from the sea?

List at least ten activities to prepare on board when drawing up a plan to recover survivors.

**[10]**

**QUESTION 3**

- 3.1 Illustrate with a neat drawing the typical load line marks on the side of a vessel with the following details:
- 3.1.1 Deck line
  - 3.1.2 Plimsoll mark with Lloyds's Register
  - 3.1.3 Freshwater load line
  - 3.1.4 Tropical freshwater load line
  - 3.1.5 Tropical load line
  - 3.1.6 Summer load line
  - 3.1.7 Winter load line
  - 3.1.8 Winter North Atlantic load line (10)
- 3.2 What is the freeboard of a ship? (2)
- 3.3 What is the gross tonnage of a ship? (4)
- 3.4 What is the dead weight of a ship? (4)
- [20]**

**QUESTION 4**

Your vessel is navigating in reduced visibility of about one mile steering 020° (T) at 10 knots.

The navigator detects two targets on the 6-mile range radar with the following observations:

TIME	Target 'A'			Target 'B'	
	BEARING	RANGE		BEARING	RANGE
22:00	040° (T)	5,5 miles		020° (T)	1,0 mile
22:03	040° (T)	4,5 miles		020° (T)	1,0 mile
22:06	040° (T)	3,5 miles		020° (T)	1,0 mile

4.1 Plot both of the targets on the plotting sheet provided. (10)

4.2 Compile a full target report including the targets' aspect at 22:06. (12)

4.3 Which target is the greatest hazard to your vessel:

Target 'A', or Target 'B'? (2)

4.4 4.1.1 In terms of the Collision Regulations, is your vessel required to take any avoidance action in this situation? Yes or No. (1)

4.1.2 If YES, then what action should be taken in this situation? (5)

**[30]**

<b>90 marks</b>
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**SECTION B            COMMUNICATIONS AND METEOROLOGY****QUESTION 5**

5.1     Describe what an EPIRB is. (10)

5.2     GMDS requires ships of 300 gross tons and above on international voyages to have a range of equipment capable of performing nine communication functions. List five of these functions. (5)  
**[15]**

**QUESTION 6**

Explain how land and sea breezes are caused.

**[20]**

<b>35 marks</b>
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**SECTION C            SAILINGS****QUESTION 7**

A vessel on passage from Cape Town (Zone 'B') to Rio Plata (Zone 'Q') departs from a position Lat.  $33^{\circ} 45' \text{ S}$  Long.  $018^{\circ} 15' \text{ E}$ .

The destination position is Lat.  $35^{\circ} 30' \text{ S}$  Long.  $055^{\circ} 00' \text{ W}$ .

7.1     What is the required Rhumb Line course and distance?

LATITUDE	MERIDIONAL PARTS
$33^{\circ} 45' \text{ S}$	2 140,41
$35^{\circ} 30' \text{ S}$	2 267,43

(19)

7.2     If the vessel commences its passage on 2<sup>nd</sup> February at 14:00 (time zone 'B'), and expected to average 19 knots, what is the ETA at Rio Plata (time zone 'Q')?

(6)

<b>25 marks</b>
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**Total: 150 marks**