NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2022

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

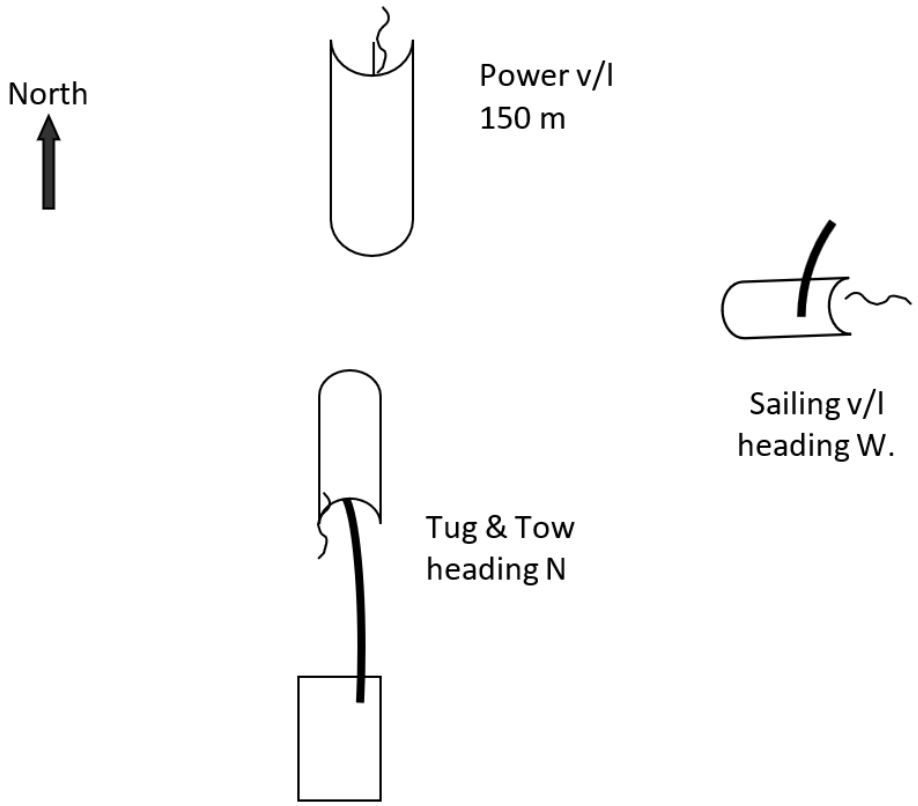
ANNEXURES – Nil

SECTION A SEAMANSHIP

QUESTION 1

The following vessels are in clear weather and in close proximity to each other (so as to involve possible risk of collision):

- A tug and tow heading north;
- A power-driven vessel of length 150 m heading south;
- A sailing vessel heading west and 4 points on the port bow of the vessel heading south.



1.1 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)? (10)

1.2 What should each of the vessels mentioned in the question above sound in fog (restricted visibility)? (10)

1.3 What sound signal shall each of the vessels mentioned in the question above sound in sight of one another (in clear visibility)? (4)

1.4 Draw the lights and shapes displayed by the tug (less than 50 m in length) and its tow (the overall length of the tug and tow is less than 200 m) underway viewed from:

(a) ahead; (3)

(b) astern. (3)

[30]

QUESTION 2

List ten recognised signals used or exhibited to indicate your vessel is in distress and needs assistance. **[10]**

QUESTION 3

3.1 The hold of a ship is partly filled with bulk grain. During the loading the ship takes a list, and a quantity of grain shifts so that the surface of the grain remains parallel with the waterline.

Show the effect of this shift of grain on the ship's Centre of Gravity. Illustrate your answer with a cross section sketch of the ship clearly indicating the ship's keel and centre of gravity before and after the grain shift. (15)

3.2 State the principle of Archimedes. (5)
[20]

QUESTION 4

Your power-driven vessel is on a course 180° (T) at a speed of 12 knots. The visibility is below 1 n. mile.

The radar observation of an approaching target shows the following:

TIME	BEARING	RANGE
08h06	235° (T)	5,5 M
08h12	234° (T)	4,5 M
08h18	232° (T)	3,5 M

4.1 Make a suitable plot on the plotting sheet provided. (6)

4.2 Determine the target's true course and speed. (4)

4.3 Determine the time and distance of the target's nearest point of approach (assuming no alteration of course or speed). (4)

4.4 Determine the appropriate action your vessel should take on the basis of your plot, and also assuming continued restricted visibility. (6)
[20]

QUESTION 5

Give one valid reason why the following vessels are commonly found in the port indicated with each vessel type:

- Dry bulk carriers --- Saldanha Bay; (2)
- Naval vessels --- Simon's Town; (2)
- Rig supply boats --- Mossel Bay; (2)
- Tankers --- Durban; (2)
- Dry bulk carriers --- Richards Bay. (2)

[10]

90 marks

SECTION B COMMUNICATIONS AND METEOROLOGY

QUESTION 6

6.1 How would you transmit a distress message by VHF (very high frequency) radio? Assume the name of your ship is "Agulhas" and the call sign is ZSST. Use the phonetic alphabet where necessary. (9)

6.2 What flag signal is flown by a ship indicating "I AM DISABLED; COMMUNICATE WITH ME"?

Also give the phonetic alphabet for this flag signal. (4)

6.3 Which is the most important flag flown by a ship in port, and where would you see this flag displayed on the ship? (2)
[15]

QUESTION 7

7.1 Describe and draw any four of the possible seven isobaric systems found at sea (northern hemisphere) showing the typical pressures, wind directions and any other indicators on your sketch. (16)

7.2 What is the benefit of having a barograph on a ship trading internationally? (4)
[20]

35 marks

SECTION C SAILINGS

QUESTION 8

Explain the reason why "Plane Sailing" is used in certain circumstances and "Mercator sailing" in different circumstances.

[10]

QUESTION 9

9.1 A vessel is on passage from Durban to Port Elizabeth. On 1 March 2004 at 18h00 (AST) the vessel's position was determined as 33° 15'S 28° 00'E. Calculate the course and distance to reach Algoa Bay position 34° 00'S 26° 00'E. (10)

9.2 Calculate the estimate date and time (SAST) of arrival of the vessel at the position in Algoa Bay if the vessel makes 12 knots over the ground. (5)

[15]

25 marks

Total: 150 marks