NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2021

NAUTICAL SCIENCE: PAPER II

Time: 3 hours 150 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 5 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

In compliance with the International Regulations for Preventing Collision at Sea, 1972 as amended (hereinafter referred to as the COLREGS), answer the following questions:

1.1 What action should a power-driven vessel take when being overtaken by another vessel and there is a risk of collision? (10)

1.2 What does the term "vessel restricted in her ability to manoeuvre" mean? (4)

1.3 List the six types of operations that the term "vessel restricted in her ability to manoeuvre" would be engaged in. (6)

1.4 Describe, with the aid of a sketch, the lights and day shapes that a vessel not under command (NUC) is required to exhibit whilst underway. (8)

1.5 Two power-driven vessels making way through the water and crossing, are in risk of collision. What is the responsibility of the vessel which has the other on her own starboard side? (2)

[30]

QUESTION 2

List, in order of priority, ten action points the officer of the watch would immediately take in the event of the vessel running aground.

[10]

QUESTION 3

Explain, with the aid of diagrams, the following terms:

3.1 metacentre (5)

3.2 the metacentric height (5)

3.3 stable equilibrium of a vessel (4)

Diagrams (6)

[20]

QUESTION 4

A tanker proceeding in a buoyed channel, with reduced visibility of about 1 mile on a course of 130° (T) and speed of 10 knots.

The following observations were made of three targets detected on radar:

Target 'A'		
TIME	**BEARING**	**RANGE**
00:00	080 ° (T)	12.0 miles
00:03	080½ ° (T)	10.4 miles
00:06	081 ° (T)	8.7 miles
Target 'B'		
00:00	118½ ° (T)	10.0 miles
00:03	117 ° (T)	9.0 miles
00:06	116 ° (T)	8.0 miles
Target 'C'		
00:00	141½ ° (T)	10.0 miles
00:03	143 ° (T)	9.0 miles
00:06	144½ ° (T)	8.0 miles

4.1 Plot the targets on the plotting sheet provided. (15)

4.2 Compile a full target report of all three at 00:06. (5)

4.3 Due to her draft it is required for the vessel to stay in the buoyed channel. Standing orders are to maintain a minimum safe CPA of 1 mile.

What action would you take to comply with Rule 19 of the COLREGS, and comply with these instructions? (5)
[25]

QUESTION 5

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

5.2 What is a "reefer" vessel? (5)
[10]

95 marks

SECTION B COMMUNICATIONS AND METEOROLOGY

QUESTION 6

6.1 What is an "URGENCY" message? (6)

6.2 What is the distress frequency for radio telephony? (2)

6.3 When are the distress silence periods? (2)
[10]

QUESTION 7

7.1 What causes wind to blow in a particular direction? (2)

7.2 Near the equator the wind tends to move parallel to the isobars, but elsewhere it tends to be deflected. What is the deflecting force called? (1)

7.3 In which direction is this deflection in the southern hemisphere? (2)

7.4 Describe, with the aid of a sketch, an anticyclone. In your sketch show the relevant pressures of each of the isobars and wind direction, assuming this is in the northern hemisphere. (15)
[20]

30 marks

SECTION C SAILINGS

QUESTION 8

A vessel in GPS position Lat. 31° 06' S Long. 013° 35' E receives a distress call from another vessel in Lat. 26° 34' S Long. 006° 14' E.

8.1 What is the course and distance to the vessel in distress? (20)

8.2 The vessel burns an average of 74 tons of fuel per day at full speed.

If the vessel proceeds at full speed of 22 knots, what quantity of fuel will be consumed to reach the distress position? (5)

25 marks

Total: 150 marks