



NATIONAL SENIOR CERTIFICATE EXAMINATION  
NOVEMBER 2016

**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 4 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

**ANNEXURES** – Nil

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**SECTION A SEAMANSHIP**

**QUESTION 1**

1.1 In terms of the International Regulations for Preventing Collision at Sea, 1972 as amended (hereinafter referred to as the COLREGS) Rule 18, complete the following questions:

1.1.1 A power-driven vessel under way shall keep out of the way of what vessels? (4)

1.1.2 A vessel engaged in fishing, when under way shall, as far as possible, keep out of the way of what vessels? (2)

1.1.3 A sailing vessel under way shall keep out of the way of what vessels? (3)

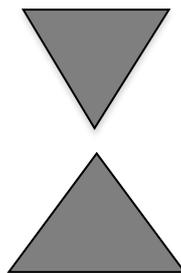
1.1.4 A WIG craft operating on the water surface shall comply with the Rules of this Part as which one of the following?

- A a sailing vessel
- B a power-driven vessel
- C a vessel restricted in her ability to manoeuvre (1)

1.2 The following day shapes are displayed by various vessels. In each case describe:

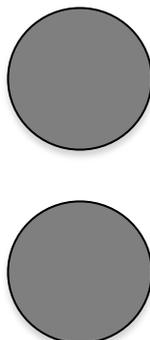
- (i) the vessel's activity and navigation status (under way/making way);
- (ii) the navigation lights displayed at night seen from ahead and astern (detailed sketch required);
- (iii) the vessel fog signal in restricted visibility.

1.2.1 A vessel displaying two cones point to point in a vertical line one above the other.



(10)

1.2.2 Two black balls in a vertical line.



(10)  
[30]

**QUESTION 2**

2.1 What preparations should a rescue vessel make 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)

2.2 Draw a typical 'Expanding Square Search Pattern' for a single search vessel. (5)  
[15]

**QUESTION 3**

3.1 State Archimedes' Law of Flotation. (5)

3.2 Illustrate by means of a sketch how Archimedes' Law of Flotation applies to the flotation of a box-shaped vessel weighing 3 tons floating in a liquid. (10)

3.3 Sketch a box-shaped barge of dimensions 2 m height and 4 m width with a centre of gravity 2,5 m above the keel.

If the barge is floating upright with a draught of 1,0 m, illustrate the position of the Centre of Buoyancy. (5)  
[20]

**QUESTION 4**

Your vessel is power-driven steering a course 090° (T) with speed 12,0 knots. Visibility is a good 12 miles and the lights of the following two targets are visible.

TIME	TARGET 'A' brg. & dist.	TARGET 'B' brg. & dist.
22:13	077° × 10.8'	096° × 10.0'
22:18	077° × 8.4'	097° × 9.0'
22:23	077° × 6.0'	098° × 8.0'

4.1 Plot both targets 'A' and 'B' on the plotting sheet provided. (10)

4.2 Complete the full target reports for both 'A' and 'B'. (10)

4.3 In terms of the COLREGS, what action would you take to avoid a close quarters situation? (5)  
[25]

**QUESTION 5**

5.1 Describe the design features of an oil tanker. (9)

5.2 Name two types of tankers and the typical trade each one would be employed on. (6)  
[15]

**105 marks**  
PLEASE TURN OVER

**SECTION B COMMUNICATIONS AND METEOROLOGY****QUESTION 6**

- 6.1 In the GMDSS, what is SEA AREA A2? (5)
- 6.2 What is an EPIRB? Describe the features of an EPIRB. (10)
- [15]**

**QUESTION 7**

- 7.1 What causes advection fog, and where can you mostly expect to find this condition around South Africa? (9)
- 7.2 Explain radiation fog and typically what effect this condition will have on harbour operations. (7)
- 7.3 Explain the difference in the terms 'fog' and 'mist'. (4)
- [20]**

<b>35 marks</b>
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**SECTION C SAILINGS****QUESTION 8**

A vessel on a passage from South Africa to Western Australia establishes the Noon position of the vessel at  $32^{\circ} 00.0' S$ ;  $108^{\circ} 20.0' E$ .

What is the course to steer and the distance to the next passage WP  $32^{\circ} S$ ;  $115^{\circ} 13.0' E$ ?

<b>10 marks</b>
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**Total: 150 marks**