NATIONAL SENIOR CERTIFICATE EXAMINATION
SUPPLEMENTARY EXAMINATION – MARCH 2018

NAUTICAL SCIENCE: PAPER I

Time: 3 hours 150 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 4 pages and an Annexure Booklet of 7 pages (i–vii). Please check that your question paper is complete.
2. Answer **ALL** the questions in Section A and Section B.
3. Begin the answer to each new question on a new page.
4. The use of a scientific calculator is permitted.
5. An alphanumeric calculator and dictionary are **NOT** permitted.
6. Nautical tables may be used.
7. Use Variation 22° W and the attached Deviation Card throughout.
8. It is in your own interest to write legibly and present your work neatly.

REQUIREMENTS

Drawing instruments
Graph paper
Chart SAN 3002

ANNEXURES

1. Annexure 1 – Examination notes and Deviation Card
2. Annexure 2 – Predicted Hourly Heights – Walvis Bay – November 2001
3. Annexure 3 – Altitude Correction Tables
4. Annexure 4 – Conversion of Arc of Time
5. Annexure 5 – Nautical Almanac – page 233, 1987 NOV. 30, DEC. 1, 2
6. Annexure 6 – Nautical Almanac – page 49, 1987 FEB. 27, 28, MAR. 1
7. Annexure 7 – Increments and corrections – page xxiii, increments for 42^m to 43^m

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SECTION A PRACTICAL CHARTWORK

QUESTION 1

At 06:00 your vessel is in the following position:

Lat. 34° 20,0' S; Long. 018° 10,0' E.

1.1 Determine the compass course to steer from this position so as to enter the Traffic Separation Zone approaching Table Bay from the south given the following information:

- Speed through the water is 14,0 knots,
- Current is estimated to set 270° (T) at 2 knots,
- Estimated leeway is 2° due to a NW'ly wind. (15)

1.2 Lay off the courses on the chart from this position to Table Bay Pilot Station, north of Green Point light. (5)

1.3 What is the ETA at the pilot station? (5)

[25]

QUESTION 2

Your vessel has anchored west of Green Point and the following observations were made:

- The horizontal angle by compass bearings between Robben Island light and Green Point light is 85°;
- The horizontal angle by compass bearings between Green Point light and Lions Head ∆668 beacon is 52°.

2.1 By means of horizontal angles between these points, plot the position of the vessel on the chart. (18)

2.2 What is the true bearing and range of Green Point light from this position? (2)

[20]

QUESTION 3

At 16:30 a vessel entering Valsbaai steering 018° (C) and making 3° leeway in a W'ly wind, observed Kaap Hangklip Lt bearing 073° (C).

At 17:00 Kaap Hangklip Lt was observed bearing 122° (C).

The vessel maintained an average engine speed of 18 knots during this period. The current was estimated to be setting 140° (T) at 2,5 knots.

3.1 Plot the vessel's position at 17:00. (12)

3.2 What is the true bearing and range of Cape Point Lt at 17:00? (3)

[15]

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QUESTION 4

The main channel in and out of Walvis Bay is dredged to a charted depth of 12,5 m.

A vessel loading salt at the Bulk Terminal in the port is required to load a maximum cargo within the limitations of the draft for this channel, allowing for an under keel clearance of 1,5 m.

4.1 What is the deepest draught the vessel can load to in order to sail from the port on the morning high tide of Monday, 5 November 2001? (10)

4.2 If the vessel will take 45 minutes from departure of the Bulk Terminal to the end of the channel, what time should she sail to clear out at H. W. on the a.m. tide of 5 November? (5)

4.3 In one paragraph, describe the cause of tides. (5)

[20]

QUESTION 5

5.1 From the "Tidal Streams" table on Chart 3002, what is the direction and rate of the tidal stream east of Robben Island in position 33° 48,5' S; 018° 26,3' E one hour before H. W. Springs? (5)

5.2 Describe the characteristics of the following lights:

5.2.1 Slangkop Lt (5)

5.2.2 Green Point Lt (5)

5.2.3 Kalkbaai breakwater light. (3)

5.3 Describe the characteristics of the Robben Island foghorn. (2)

[20]

100 marks

SECTION B ASTRO-NAVIGATION

QUESTION 6

A vessel in DR position 26° 00,0' S; 011° 00,0' E on 2 December 1987 was steering a compass course of 145°. The navigator observed the sun to set bearing 300° by compass. The magnetic variation in the vicinity of the vessel was given as 22½° W.

Calculate the following:

6.1 GMT and Zone Time of sunset at the vessel. (8)

6.2 The error of the vessel's compass at the time. (11)

6.3 The deviation of the compass for the vessel's heading. (3)

6.4 The true course being steered by the vessel. (3)
[25]

QUESTION 7

On 27 February 1987 a ship was in DR position 29° 43,0' N; 069° 27,0' W. The sextant angle of the sun's lower limb was observed to be 40° 41,8'. At the time of the observation the chronometer read 14h 42m 48s, and there was an error of 24 seconds fast on GMT.

The index error of the sextant was 1,0' off the arc; the height of eye of the observer was 6,1 m.

7.1 Determine the position line on which the ship was situated using the intercept method. (20)

7.2 From Question 7.1 above, schematically plot the DR position, azimuth and position line of the vessel on your Answer Sheet. (5)
[25]

50 marks

Total: 150 marks

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