NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2024

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 Sections A and B.
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. Use Magnetic Variation 17° W unless otherwise stated, and the Deviation Card, Annexure 1, throughout.
8. It is in your own interest to write legibly and to present your work neatly.

REQUIREMENTS

Drawing instruments
Chart SAN 3002

ANNEXURES

1. Annexure 1 – Examination Notes and Deviation Card
2. Altitude Correction Tables
3. Conversion of Arc to Time
4. Nautical Almanac – 1987 Nov. 30, Dec 1 and 2
5. Increments and Corrections 42^m and 43^m
6. Predicted Hourly Heights in Metres, Walvis Bay November 2001
7. Graph Paper

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SECTION A PRACTICAL CHARTWORK

Note: Marks include all work done on the Chart 3002 provided.

QUESTION 1

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

Lat. 34º 25,0'S; Long. 018º 15,0'E.

1.1 Determine the compass course to steer from this position to alter course position Lat. 34° 01,0'S; Long. 018° 15,0'E, given the following information:
- Speed through the water is 10,0 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 the alter course position to Table Bay Pilot Station, north of Green Point light using the TSS. (5)

1.3 What is the ETA at the Pilot station if the average speed will be 8 knots? (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 70°;
- 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 False Bay 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? (6)

4.2 If the vessel takes 45 minutes from departure of the Bulk Terminal to the end of the channel, what time should she sail to clear out at HW on the am tide of 5 November? (4)

4.3 What is a Tide? Describe what causes tides. (6)

4.4 'The meteorological conditions of atmospheric pressure and the effect of the wind may cause considerable differences between the predicted height of tide and the actual height.'

Is this statement TRUE or FALSE? (4)
[20]

QUESTION 5

5.1 From the 'Tidal Streams' table on Chart 3002, what is the direction and rate of the tidal stream SE of Cape Point (34º 23,4'S; 018º 32,8'E) one hour after HW Neap?

Will it be –
A Slack?
B 170º × 1,8 kn?
C 340º × 1,1 kn?
D 170º × 0,9 kn? (3)

5.2 Describe all the characteristics of the following lights and buoy:

5.2.1 Slangkop Lt. (4)

5.2.2 Kaap Hangklip Lt. (4)

5.2.3 Whittle Rock Cardinal buoy. (7)

5.3 What are the characteristics of the Robben Island fog horn?

A Siren 2 blasts every 30 secs.
B Horn 2 blasts every 20 secs.
C Horn every 20 secs. (2)
[20]

100 marks

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SECTION B ASTRO-NAVIGATION

QUESTION 6

A vessel in DR position 26° 00,0'S; 011º 00,0'E on 2nd 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 22½ºW.

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 30 November 1987 a ship was in DR position 29º 43,0'N; 069º 27,0'W. The sextant angle of the sun's lower limb was observed to be 32º 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 6,1m.

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

7.2 From 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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