



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 23° W 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. Annexure 2 – South African Tide Tables 2007, Times & Heights of HW & LW
Page 45, Durban
3. Annexure 3 – Altitude Correction Tables
4. Annexure 4 – Conversion of Arc to Time
5. Annexure 5 – Nautical Almanac – 1987 May 4, 5, 6 (Page 93)
6. Annexure 6 – Nautical Almanac – 1987 June 18, 19, 20 (Page 123)
7. Annexure 7 – Increments and Corrections 12^m 13^m (Page viii)

SECTION A PRACTICAL CHART WORK**QUESTION 1**

Prepare a passage plan for a Container Vessel on a voyage from Port Elizabeth to Table Bay anchorage.

Your plan commences on Chart SAN 3002 at **WP 1 in Lat. 34° 33,0' S; Long. 018° 49,7' E**, South of Kaap Hangklip lighthouse.

The planned voyage is to pass South of Cape Point and to terminate in the **No. 1 General Anchorage** in the chosen position with **Green Point Lt. bearing 097° (T) × 1,6 miles**.

Standing instructions include that you are to maintain a minimum safe distance of 1,5 miles from the 30 M depth as well as any navigational hazards. You are also required to adhere to the Traffic Separation Scheme.

- 1.1 Lay off the courses on the chart. (12)
 - 1.2 Prepare a table of WPs; Co-ordinates; position relative to nearest prominent headland or navigation aid; the course to steer; the distance of that course; and the distance to go to the final destination. (15)
 - 1.3 Calculate the total passage distance from WP 1; and the estimate steaming time at an average speed of 14 knots. (3)
- [30]**

QUESTION 2

What are the responsibilities of the Navigation Officer on board a ship on a passage from one port to another?

List at least five responsibilities or duties.

[5]

QUESTION 3

- 3.1 At 08:00 a ship is in position with Roman Rocks Light bearing 210° (T) × 2,8 M (Chart SAN 3002 Simon's Bay). The ship is required to steer a course to pass Kaap Hangklip bearing 047° (T) × 2,2 M.

What is the required true course to steer? (5)

- 3.2 At 09:00 the ship's position is fixed with Whittle Rock light bearing 227° (T) 2,4'. What was the set and drift of the vessel over the past hour? (5)

- 3.3 From the 09:00 position, lay off the new course to steer to make good the required position off Kaap Hangklip. (3)

- 3.4 What will be the new course to steer to counteract the set and drift found in the first hour of the passage (3.2)? (7)

Note: Marks are awarded for correct markings and clarity of your answers on the chart.

[20]

QUESTION 4

A vessel heading south out of Simon's Bay is steering a course 190° (C) and a log speed of 12 knots.

At 14:15 the bearing of Cape Point Light was 211° (C);

At 14:30 the bearing of Cape Point Light was 236° (C);

At 14:45 the bearing of Cape Point Light was 280° (C).

The current was estimated to be setting 349° (T) \times 1,8 knots.

Determine the Latitude and Longitude of the vessel at 14:45.

[15]

QUESTION 5

5.1 A vessel with a draught of 8,5 m laying at anchor off Durban Roads on 7 February 2007 obtained a sounding by hand lead line at 06:23 (zone time -2) indicating 18,0 m mark.

What will be the under keel clearance at the next LW? (6)

5.2 Define the following terminology:

5.2.1 Chart Datum (2)

5.2.2 Mean High Water Spring (2)

[10]

QUESTION 6

6.1 With reference to Chart SAN 3002:

6.1.1 What is the chart scale? (1)

6.1.2 What is the chart number of the larger scale chart for Table Bay that is outlined on this chart? (1)

6.2 To the West of Whittle Rock in Valsbaai there are two transit bearings.

6.2.1 What are these exact bearings? (2)

6.2.2 Give one example of the use of a transit bearing in navigation. (2)

6.3 There are three compass roses on the chart.

6.3.1 What is the difference between the inner and outer roses of each? (2)

6.3.2 In what way do the inner circles differ between the three different compass roses? (2)

- 6.4 What are the characteristics of Milnerton Lt.? (8)
- 6.5 In what sector is Cape Point Lt. a "Fixed Red Light"? (2)
- [20]

100 marks

SECTION B ASTRO-NAVIGATION

QUESTION 7

On 4 May 1987 an observation of the sun's upper limb at Mer Pass gave a sextant altitude of $58^{\circ} 01,9'$ south of the observer.

- 7.1 Find the latitude of the observer if the longitude was $002^{\circ} 12' E$, the height of eye was 7,3 m and the index error was 2,1' on the arc. (16)
- 7.2 Sketch the positions of P, Z and X on the celestial horizon. (4)
- [20]

QUESTION 8

On 19 June 1987 a ship in position $11^{\circ} 00' N$; $104^{\circ} 30' E$ observed with the magnetic compass the sun bearing $352^{\circ} (C)$. The chronometer time recorded 05 h 18 m 21 s. The chronometer was 06 m 09 s fast on GMT.

- 8.1 What is the compass error? (20)
- 8.2 Illustrate your calculation with the PZX triangle on the celestial horizon. (5)
- 8.3 If the variation is given as $9^{\circ} E$, find the deviation of the compass. (5)
- [30]

50 marks

Total: 150 marks