



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 6 pages (i–vi). 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 26° 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. Annexure 2 – Altitude Correction Tables
3. Annexure 3 – Conversion of Arc to Time
4. Annexure 4 – Nautical Almanac – 1987 August 17, 18, 19
5. Annexure 5 – Increments and Corrections 12^m 13^m
6. Annexure 6 – Increments and Corrections 4^m 5^m

SECTION A PRACTICAL CHART WORK**QUESTION 1**

A vessel is approaching Cape Town from the south steering a compass course 022° (C) at an estimated speed of 15,0 knots.

At 16:00 the vessel's position is fixed with Cape Point light bearing 084° (C) and Slangkoppunt light bearing 042° (C).

- 1.1 Lay off the courses and distances from the 16:00 position to safely reach Table Bay pilot position, north of Green Point light. (15)
- 1.2 Calculate the compass course to steer from the 16:00 position to the first W.P. at the beginning of the Traffic Separation Scheme, given that:
Estimated speed is 15 knots
Current is estimated to be setting 090° (T) at 1,5 knots
A westerly wind is causing a leeway of 5° . (8)
- 1.3 What is the ETA at the pilot station at an average speed of 14 knots? (2)

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

[25]**QUESTION 2**

A vessel carrying out underwater survey work west of Chapman's Peak, near Hout Bay, observed the following horizontal sextant angles:

Between Hangberg $\Delta 330$ and Chapman's Peak $\Delta 592$ sextant angle 90°
Between Chapman's Peak $\Delta 592$ and Slangkoppunt light sextant angle 98° .

- 2.1 Plot the position of the vessel on the chart, and in your answer book record the coordinates of that position. (12)
- 2.2 What is the approximate depth of water in that position? Is it greater than or less than 30 m in depth? (3)
- 2.3 Describe how you would check the index error on a sextant. (10)

[25]

QUESTION 3

A vessel in Valsbaai steering 349° (C) at 8 knots observes a single bearing of Whittle Rk. RACON Bn. 304° (C). The time was 13:15.

Half hour later at 13:45 the bearing of Whittle Rk. was observed to be 259° (C). The vessel maintained the same course and speed in that time period.

3.1 Determine the vessel's position at 13:45. (19)

3.2 What is the distance off Whittle Rk. at 13:45? (1)

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

[20]

QUESTION 4

4.1 Your vessel is entering a river port and is required to pass over a sandbank having a charted drying height of 1,1 m.

Find the height of the tide required to navigate over this sandbank if the draught of the vessel is 10,7 m.

You are required to maintain a UKC of 2,0 m. (8)

4.2 Describe the difference between "tidal stream" and "current". (16)

4.3 Where would you find information about tidal streams for the area you are sailing? (6)

[30]

100 marks

SECTION B ASTRO-NAVIGATION**QUESTION 5**

A vessel in DR position $25^{\circ} 35' S$ $012^{\circ} 07' E$ on 18 August 1987 observed by sextant the sun's lower limb to be $41^{\circ} 07.9'$ when the chronometer read $09^H 14^M 21^S$.

Chronometer error was $1^M 25^S$ fast.

Sextant IE was $1,0'$ on the arc.

Height of eye of the observer was $12,0$ m.

Determine the intercept, the direction of the position line and sketch the position through which the position line passes.

[30]

QUESTION 6

On 18 August 1987 the setting sun was observed bearing 302° (C). The vessel was in DR position Lat. $15^{\circ} 00' N$, Long. $010^{\circ} 25' W$ steering a compass course 276° (C).

Determine the following:

- 6.1 The time of sunset GMT and ship's zone time. (5)
- 6.2 The compass error and magnetic deviation if the variation for the area was $26^{\circ} W$. (10)
- 6.3 The vessel's true course. (5)
- [20]**

50 marks

Total: 150 marks