



NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2009

NAUTICAL SCIENCE: PAPER I

Time: 3 hours

Marks: 150

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 4 pages and 6 annexures (Tables). Please check that your question paper is complete.
 2. Answer ALL the questions in Sections A and B.
 3. Begin the answer to each 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 Variation 24°W and the attached Deviation card throughout.
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REQUIREMENTS

Drawing instruments
Graph paper
Chart SAN 3002

ANNEXURES

1. Examination notes and Deviation Card
 2. Predicted Hourly Heights – Knysna – December 2007
 3. Altitude Correction Tables
 4. Conversion of Arc to Time
 5. Nautical Almanac – page 163, 17 – 19 August 1987
 6. Increments and Corrections 50^{m} to 53^{m} .
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SECTION A PRACTICAL CHARTWORK**QUESTION 1**

As Navigating Officer you are required to prepare a passage plan for a voyage to Cape Town from Port Elizabeth. Given the following Way Points (WP):

WP 1	34° 30,2'S	018° 50,0'E	
WP 2	34° 23,3'S	018° 19,0'E	
WP 3	34° 10,0'S	018° 15,0'E	
WP 4	34° 01,0'S	018° 15,0'E	
WP 5	33° 52,5'S	018° 21,0'E	
WP 6	33° 52,5'S	018° 24,0'E	Pilot Station

- 1.1 Lay off the courses on the chart SAN 3002. (10)
- 1.2 Draw up a table with the True courses and distances between each WP. (5)
- 1.3 What is the steaming time from WP 1 to the Pilot Station if the vessel's speed averages 16 knots? (5)

[20]**QUESTION 2**

At 13:00 hrs a vessel is in position with Kaap Hangklip Lt. bearing 090° (T) x 3,0 miles, and wishes to pass 1 mile off Whittle Rock Racon Buoy in Valsbaai. The current is setting 225° (T) at 3 knots. The speed of the vessel is 12 knots.

- 2.1 Find the compass course to steer, to pass 1 mile off Whittle Rock Racon Buoy. (16)
- 2.2 At what time will the buoy be abeam? (4)

[20]

QUESTION 3

Cape Point Lt. Hse. was observed to bear 270° (C) when the ship's head was 210° (C), while the vertical sextant angle was observed to be $0^{\circ} 12,5'$.

The sextant index error is $1,2'$ on the arc. The state of the tide is estimated to be 1,0 m below MHWS.

Plot the position on the chart. What are the Latitude and Longitude coordinates of the vessel?

[20]

QUESTION 4

Your vessel is due to sail from Knysna on the rising tide during the morning of 1 December 2007. The channel through Knysna Heads is 5,2 m. You are required to have a minimum clearance at all times of 2,5 m beneath the keel, and the draught of your vessel is 4,2 m.

If the steaming time from where your vessel is berthed to the Heads is 45 minutes, what is the latest time that you may depart in order to cross through the Heads on the rising tide?

[20]

QUESTION 5

- 5.1 What is a suitable anchorage for a container vessel with a draught of 12 m in December (summer) off Cape Town?

Mark the position on the Chart SAN 3002, and state the position on your answer sheet with reference to the bearing and range to Green Point Lt. Hse.

(5)

- 5.2 What is the variation to apply to the true bearing in the year 2009 on the compass rose SW of Cape Point on Chart SAN 3002?

(5)

- 5.3 What do the cardinal marks indicate on the Racon Buoy at Whittle Rock in Valsbaai?

(2)

- 5.4 Describe the characteristics of Slangkoppunt Light House.

(8)

[20]

100 marks

SECTION B ASTRO-NAVIGATION**QUESTION 6**

On 19th August 1987 your vessel is in D R position Lat. 28° 00'S Long. 010° 05'E, and the sextant altitude of the sun's lower limb was observed to be 35° 23,7' when the chronometer read 08h 53m 23s. The chronometer error was 45 seconds slow on GMT.

Index error of the sextant: 1,0' on the arc
 Observer's height of eye: 6,2 metres

- 6.1 Determine the position line on which the ship was situated using the intercept method. (20)
- 6.2 Plot the DR position, azimuth and position line schematically on your answer sheet. (5)

[25]**QUESTION 7**

On 19th August 1987 your vessel is steering 302° (C) in D R position Lat. 27° 30'S Long. 010° 15'E. The sun was observed to rise bearing 085° (C). The magnetic variation in the area is 24°W.

- 7.1 Determine the following:
- 7.1.1 GMT and Zone time of sunrise (10)
- 7.1.2 The vessel's compass error (6)
- 7.1.3 The deviation of the compass (2)
- 7.1.4 The true course of the vessel (2)
- 7.2 Show by means of a sketch on the plane of the celestial horizon the following:
- 7.2.1 The declination (X) (1)
- 7.2.2 The celestial equator (Q) (1)
- 7.2.3 The zenith position (Z) (1)
- 7.2.4 The elevated pole (P) (1)
- 7.2.5 The amplitude of the sun (θ°) (1)

[25]**50 marks****Total: 150 marks**