

Candidate's Name:

**Ports and Maritime Organization
Examination and Certification Directorate**

Exam Code : CMCN

Subject: Terrestrial and Coastal Navigation & Nav Aid

Rank : Chief Mate (GT \geq 3000)

Date:

Time allowed: 3.0 Hrs

*Use deviation card no1, tide table 2000, chart No:1121, nories table, and variation as per chart.
Positions in the brackets are only for guidance and should not be used as actual position of symbols.*

Part a : total marks(70 Marks)

- Q.1)** a) At 0530 hours in DR position $54^{\circ} 26' N$ $005^{\circ} 09' W$ the relative bearing of SOUTH ROCK Lt($54^{\circ} 24' N$ $005^{\circ} 21' W$) was 065° . The ship was steering $210^{\circ} C$ speed 16 kts, and at 0845 hours ROCK ABILL Lt($53^{\circ} 36' N$ $006^{\circ} 00' W$) bore $255^{\circ} C$. Find the latitude and longitude of the position at 0845 hours, and the time and distance off when beam of CALF OF MAN Lt.Fl.15s28M($54^{\circ} 03.5' N$ $004^{\circ} 50' W$). If a tidal stream set $065^{\circ} T$ at 2 knots and a westerly wind was causing 5° leeway throughout. **(20 Marks)**
- Q.2)** At 0500 hours in DR position $52^{\circ} 00' N$ $006^{\circ} 00' W$ vessel steering $055^{\circ} C$ at 15 kts an observation of star bearing $110^{\circ} T$ gave a longitude of $005^{\circ} 57' W$, at the same time TUSKAR ROCK Lt($52^{\circ} 12' N$ $006^{\circ} 13' W$) bore 262° Relative. Find compass course to steer in order to pick up BARDSEY Lt ($52^{\circ} 46' N$ $004^{\circ} 48' W$) 30° on the starbd bow at its maximum range of visibility and the time to reach this position. Visibility perfect. height of eye 9 m and height of light 25 m. **(20 Marks)**
- Q.3)** A vessel intends to sail out Oostende(ATT vol.1) on 24th March 2000 with a draught of 8.0 meter forward and 9.6 meter aft. Calculate the earliest time, when she can cross a bar at the entrance where the charted depth is 8mtrs, with a clearance of 1 meter. **(15 Marks)**

- Q.4)** Find the great circle distance and the initial course and the position of the vertex between the following positions: **(15 Marks)**
From: **a)** $36^{\circ} 15' S$, $056^{\circ} 35' W$
To : **b)** $15^{\circ} 57' S$, $005^{\circ} 40' W$

Part b : total marks(30 Marks)

- Q.1)** Explain the principles on which the Global Positioning System (GPS) works and how the accuracy of position fix is achieved by DGPS. **(15 Marks)**
- Q.2)** Explain following in magnetic compass;
- a)** Importance of keeping a record of observed deviation. **(8 Marks)**
 - b)** Operational checks for magnetic compass and its performance. **(7 Marks)**

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Part a : total marks(70 Marks)

- Q.1)** At 1800 hrs, from a vessel steering 010° (C), Calf of Man Lighthouse (54° 3.4' N 004° 50' W) bore 055° (C). At 1840 hrs, it bore 087° (C), and the distance off by vertical sextant angle was found to be 14 miles. At 1930 hrs, the same light bore 148° (C). The tidal stream was known to set 045° T, at 3 knots. Required the speed of the vessel, the position at 1930 hrs, and the course made good. **(20 Marks)**
- Q.2)** In hazy weather a vessel in a position with Tuskar Rock Lighthouse(52° 12' N 006° 12' W) bearing 270° T, distant 10 miles, and steaming at a reduced speed of 8 knots, set a course to reach a position with S. Stack Lighthouse(53° 18' N 004° 42' W) bearing 180° (T), distant 8 miles. Two and a half hours later the weather cleared, speed was increased to 16 knots and course altered accordingly. The tidal stream was known to set 000° T, at 2 knots. Required the compass courses steered and the time taken to bring Bardsey I. Lighthouse (52° 45' N 004° 47' W) abeam. **(20 Marks)**
- Q.3)** A vessel intends to sail out **Hastings** (ATT vol.1) on 8th March 2000 with a draught of 7.5 meter forward and 8.5 meter aft. Calculate the Latest time, when she can cross a bar at the entrance where the charted depth is 6.0 meters, with a clearance of 1.0 meter. **(15 Marks)**

- Q.4)** Compare the Great Circle and Rhumb line distance between the following positions: **(15 Marks)**
- From **A:** 38° 00' N, 123° 30' W
To **B:** 34° 40' N, 139° 54' E

Part b : total marks(30 Marks)

- Q.1)** Explain the method of calculating deviation and reason for keeping deviation card on board. **(15 Marks)**
- Q.2)** Explain following in gyro compass;
- a) Properties of the free gyroscope. **(8 Marks)**
 - b) Conversion of a free gyro to a gyro compass. **(7 Marks)**