

**DIRECTORATE OF MERCHANT SHIPPING**  
**GOVERNMENT OF SRI LANKA**  
**CERTIFICATE OF COMPETENCY EXAMINATION**

GRADE : CHIEF MATE ON SHIPS OF 500 GT OR MORE (UNLIMITED)  
SUBJECT : NAVIGATION  
DATE : 13<sup>th</sup> May 2016

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|                          |             |       |
|--------------------------|-------------|-------|
| Time allowed THREE hours | Total marks | : 180 |
| ANSWER ALL QUESTIONS     | Pass marks  | : 70% |

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Formulae and all intermediate steps taken in reaching your answer should be clearly shown. You may draw sketches wherever required. Electronic devices capable of storing and retrieving are **not** allowed.

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- 1) A 115000 GT bulk carrier is to make a loaded passage between Valparaiso (Chile) to Yokohama (Japan), carrying a cargo of phosphates and is expected to have a departure draught of 16.6 metres.

The vessel carries navigation equipment as per statute and has a service speed of 16.0 knots. The vessel is due to depart Valparaiso on the 1st September.

The vessel is to use the following departure and landfall positions.

Departure Position 33 03.0 S 071 48.0 W

Landfall Position 35 18.0 N 139 42.0 E

Calculate EACH of the following:

- a) the great circle distance; (10 marks)
  - b) the final course on the great circle track; (10 marks)
  - c) the position of the vertex, lying North of the Equator. (10 marks)
- 2) A vessel passing Bermuda decides to increase the passing distance to 30 miles due south of Bermuda due to the fact that the island is surrounded by low lying islands, banks and reefs on which there are numerous wrecks and obstructions.

At the vessel's intended service speed it will be due to pass Bermuda approx 2 hours after sunrise on the 13th September.

The OOW obtains the following observations during morning twilight on the 13th under clear skies, good visibility and calm seas. The vessel was steaming at 19 knots on a course of 0950(T).

| Time     | Object   | Azimuth              | True Alt | Calc Alt |
|----------|----------|----------------------|----------|----------|
| 0545 hrs | Arcturus | 037°(T)              | 41°15'.7 | 41°10'.9 |
| 0550 hrs | Rigel    | 1300(T)              | 43°13'.8 | 43°20'.4 |
| 0555 hrs | Vega     | 315 <sub>0</sub> (T) | 36°45'.3 | 36°39'.4 |
| 0603 hrs | Canopus  | 2200(T)              | 58°19'.5 | 58°27'.1 |

- a) Determine the vessel's position at 0600 hrs. using a DR position of 31°45'N 62024'W to work each sight. (20 marks)
- b) At 0620 hrs the OOW obtains a radar range and bearing of what is thought to be one of the low lying islands south of Bermuda at a range of 26 miles.

The vessel's GPS receiver puts the vessel 0.5 miles to the south of the vessel's charted track, the radar observation puts the vessel 4 miles to the south of the track and the celestial observation above puts the vessel approximately 10 miles to the north of the vessel's track.

Discuss the reliability of EACH of the above observations.

(10 marks)

- 3) Whilst taking evasive action to avoid the storm one of the engine room ratings falls and breaks a leg. The Master decides to that the rating needs immediate attention and makes contact with a US warship at 0830 hrs UT on the 21st September.

The vessel's current position is 21 30.0N 167 24.0E. The warship is in position 24 54.0N 172 36.0E.

It is agreed to rendezvous at sunrise the following day with own vessel maintaining a course of 345(T) and at a maximum speed of 18 knots.

Calculate EACH of the following:

- a) the UT of sunrise; (10 marks)
- b) the rendezvous position, (10 marks)
- c) the course and speed required by the warship to make the rendezvous. (10 marks)
- 4) a) Several publications contain guidance to Masters on determining the composition of the Bridge team under varying operational conditions.

Outline factors that should be considered by the Master when determining appropriate manning levels necessary on the bridge.

(20 marks)

- b) Describe items of information that the Pilot should tell the Master, when proceeding up river to the berth.  
(10 marks)
- 5) Vessels approaching the coast of New Zealand often have problems in making a landfall due to heavy cloud cover and poor visibility in winter.
- a) List the factors that should be taken into account when planning a landfall after a long ocean passage.  
(12 marks)
- b) Discuss the most important factors to be taken into account when choosing a safe anchorage.  
(18 marks)
- 6) Vessels on passage between Central America and NW Europe may encounter tropical revolving storms. (TRS)
- a) Describe the warning signs of an approaching tropical revolving storm.  
(12 marks)
- b) Sketch a plan view of a TRS, in the northern hemisphere, indicating ALL the relevant features.  
(8 marks)
- c) Explain how shipboard observations can be used to determine the vessel's position relative to the centre of a tropical revolving storm.  
(10 marks)