



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

GRADE : CHIEF MATE ON SHIPS OF 500 GT OR MORE (UNLIMITED)
SUBJECT : Meteorology
DATE : 16/08/2021

Time allowed **THREE** hours

Total marks : 180

ANSWER ALL QUESTIONS

Pass marks : 50%

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.

1)

- a) A vessel trading in North Atlantic received a weather analysis chart (weather analysis chart is provided) and at the time of receiving it, the position of the vessel is latitude $60^{\circ} 00' N$, Longitude $020^{\circ} 00' W$ and her course is 225° . Describe the weather forecast for the next few hours.

(18 marks)

- b) Calculate the surface wind speed at following positions. (In the Analysis chart Geostrophic Wind Scale – Geostrophic wind speed in knots)

(i) $50^{\circ} 00' N$, $030^{\circ} 00' W$

(ii) $40^{\circ} 00' N$, $040^{\circ} 00' W$

(06 marks each)

2)

- a) The common tendency of troposphere is temperature decreases as the height increases. But at times it is noticeable temperature inversion and isothermal layers in the troposphere. Explain with suitable diagrams temperature inversion and isothermal layer including main influences causing these phenomenon's.

(15 marks)

- b) Movement of atmospheric air in the troposphere can be categorized as horizontal and vertical atmospheric air movement. Each of these air movements may be influenced by different conditions of the atmosphere. Explain in detail each main cause for vertical movement of atmospheric air.

(15 marks)

3) Define following with suitable sketches where applicable

- a) Coriolis force
- b) Pressure Gradient force
- c) Katabatic Wind
- d) Cumulonimbus Cloud
- e) Line-squall

(06 marks each)

4)

a) Movement of air mass in middle latitudes will result formation of frontals and frontal depressions. Briefly define and describe what is an air mass and factors effecting properties of an air mass.

(15 marks)

b) Convergence of two air masses does not always means formation of frontals or frontal depressions. Explain in detail with suitable sketches why there are no frontal or frontal depressions occurring at equatorial reigns.

(15 marks)

5) Structurally, a tropical cyclone is a large, rotating system of clouds, wind, and thunderstorms. Its primary energy source is the release of the heat of condensation from water vapor condensing at high altitudes, the heat being ultimately derived from the sun.

a) Briefly explain the environmental conditions that support formation of tropical cyclones.

(08 marks)

b) List down warning signs of tropical cyclones and use of new technology to forecast them.

(10 marks)

c) Explain general avoiding actions for S/H for following conditions.

- i. If vessel lies in dangerous quadrant,
- ii. If vessel lies in the path of the TRS
- iii. If vessel lies in the Navigable semi circle

(12 marks)

- 6) In merchant shipping, there are many casualties reported due to sea ice and icebergs. Knowledge and information relating to sea ice and icebergs may help mariner to avert such situations effectively. With regards to sea ice and iceberg answer following questions.
- a) There are two primary reasons for movement of sea ice and icebergs. Briefly explain these two primary reasons of the movement of sea ice and icebergs.
(10 marks)
 - b) Information relation to sea ice and ice bergs will help mariner to take precautions in advance. Enumerate sources of information available to mariner with regards to sea ice and icebergs.
(10 marks)
 - c) Early identification of ice and iceberg during navigation in effected area is primary concerns of mariners. Briefly explain signs of ice in the vicinity sea ice and icebergs.
(10 marks)

