

MERCHANT SHIPPING SECRETARIAT

GOVERNMENT OF SRI LANKA CERTIFICATE OF COMPETENCY EXAMINATION

GRADE : CHIEF MATE ON SHIPS OF 500 GT OR MORE (UNLIMITED)

SUBJECT: Marine meteorology
DATE: 28th November 2018

Time allowed **THREE** hours Total marks : 180 **ANSWER ALL OUESTIONS** 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) Describe why wind blows parallel to isobars in the eye wall area of a Tropical Revolving Storm (TRS).

(05 marks)

a) A vessel is located 300 nm from the edge of the outer storm area of a TRS in Northern hemisphere. With aid of a diagram explain the danger areas that should be avoided by the vessel.

(10 marks)

- b) Due to the unusual path taken by the TRS in (a), the vessel is now in the outer storm area. Using the below weather observations locate the vessel's position in relation to the TRS and state what actions should be taken to avoid the eye wall and eye of the TRS.
 - i. Atmospheric Pressure: 5 mb below normal and decreasing
 - ii. Wind force 6 and increasing
 - iii. True Wind E'ly then veering

(15 marks)

2)

a) Briefly explain upwelling and name an area where that occurs.

(05 marks)

b) In the given map (**Map no: 1**) mark all major currents in the North Atlantic Ocean and highlight all cold currents.

(20 marks)

c) What is "Longshore current".

(05 marks)

3) Use the annexed surface analysis chart (**Map No: 2**) and sea state chart (**Map No: 3**) for North Atlantic to answer following questions.

A vessel sailing from Europe to East coast of United States is currently in a position of 40°00'N, 050°00'W.

a) Write down the current weather, including the (most frequent) probable wave height, the vessel is experiencing.

(10 marks)

b) What is the maximum wave height the vessel is likely to encounter at that position.

(05 marks)

c) If the vessel is steering a course of WSW, state what changes in weather that you would expect.

(05 marks)

d) In the given map mark the areas of good weather.

(05 marks)

e) Mark the area of highest wind speed in the storm centered near 47°00'N, 054°00'W (977mb)

(05 marks)

- f) Briefly describe
 - i. Significant Wave Height
 - i. Most Frequent (Probable) Wave Height
 - ii. Maximum wave height

(05 marks each)

- 4) To answer this question, use 72 hr Surface Prognosis chart (Map No: 4) and 72hr 500mb Chart (Map No: 5).
 - a) Identify and mark all ridges and troughs in the 500mb chart.

(05 marks)

b) Explain the significance of the 5640m height contour in the 500mb chart.

(05 marks)

c) A developing low pressure (1016mb) system is shown at 45°00'N, 075°00'W on 72 hr surface prognosis chart. Using the 500mb chart, predict whether the low pressure system will deepen in to a storm.

(05 marks)

d) What is the likely movement (direction and speed) of low pressure system stated in (c) above.

(05 marks)

5)

- a) Describe following terms:
 - i. Frazil Ice
 - ii. Pack ice
 - iii. Fast Ice
 - iv. Ice Blink
 - v. First year ice

(02 marks each)

b) Using the Ice Analysis chart (**Map No:6**) state the ice condition a vessel would encounter at position 50°00' N, 050° 00'W when approaching New Foundland.

(15 marks)

c) As per the Iceberg analysis chart (**Map no:7**), state the number of icebergs present below 55°N parallel in the North Atlantic Ocean.

(02 marks)

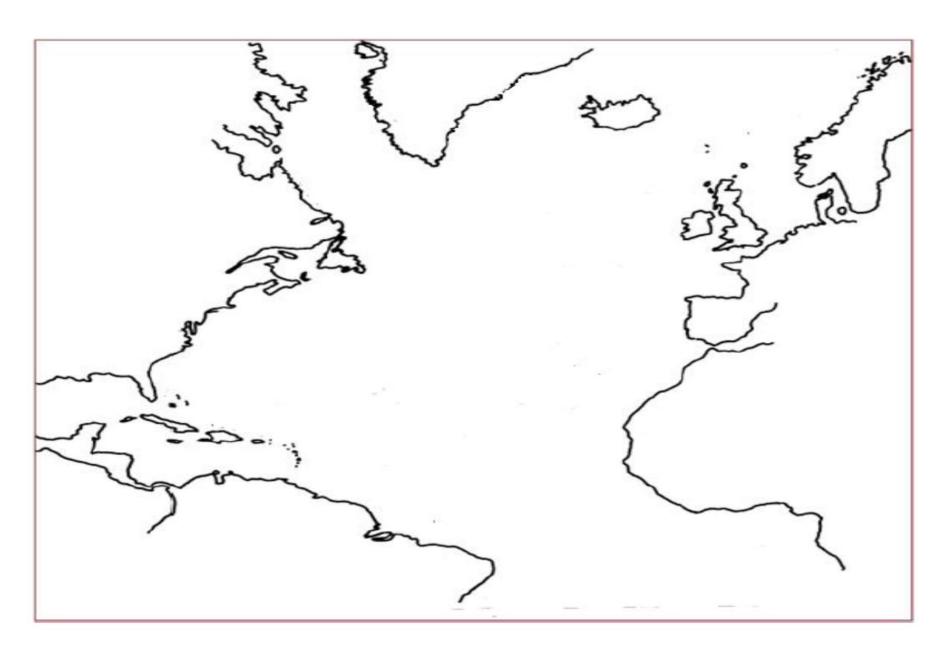
d) What are the ice limits in Northern and Southern Hemisphere?

(08 marks)

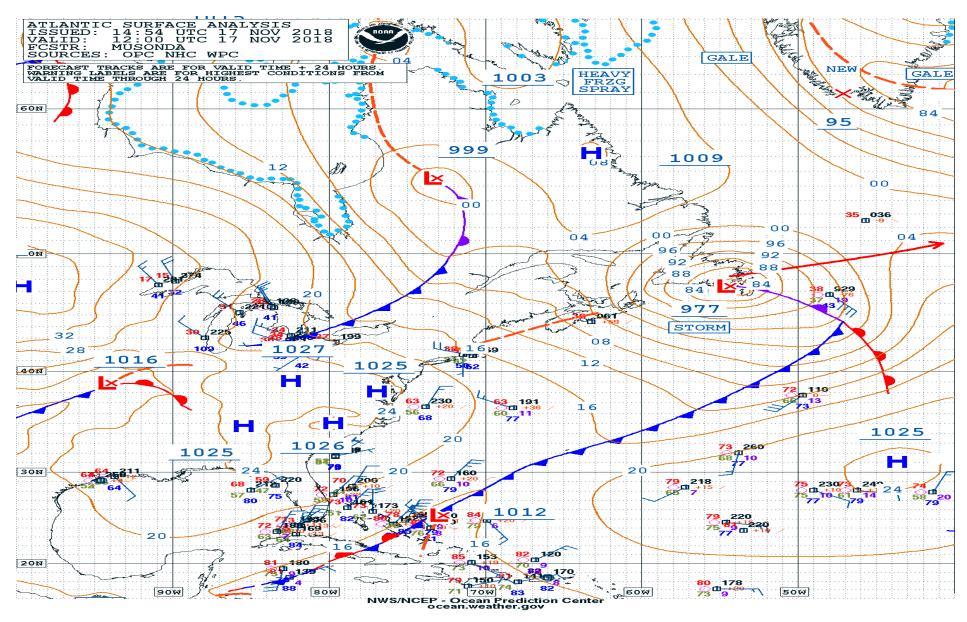
- 6) Briefly describe following routes used in Optimum Routing:
 - a) Least time
 - b) Least time with least damage
 - c) Least damage
 - d) Constant Speed

(05 marks each)

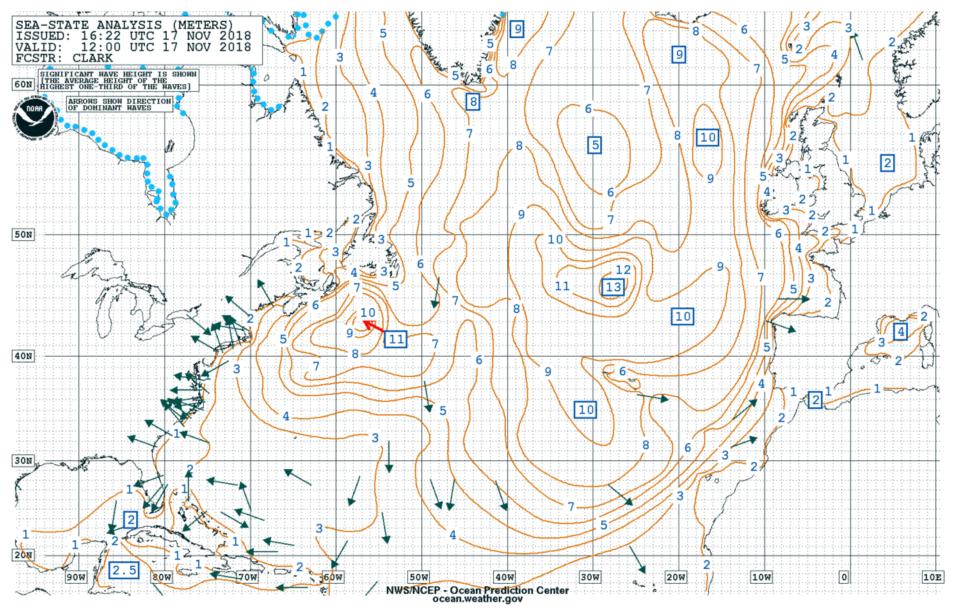
MAP 1: North Atlantic Ocean (Blank)



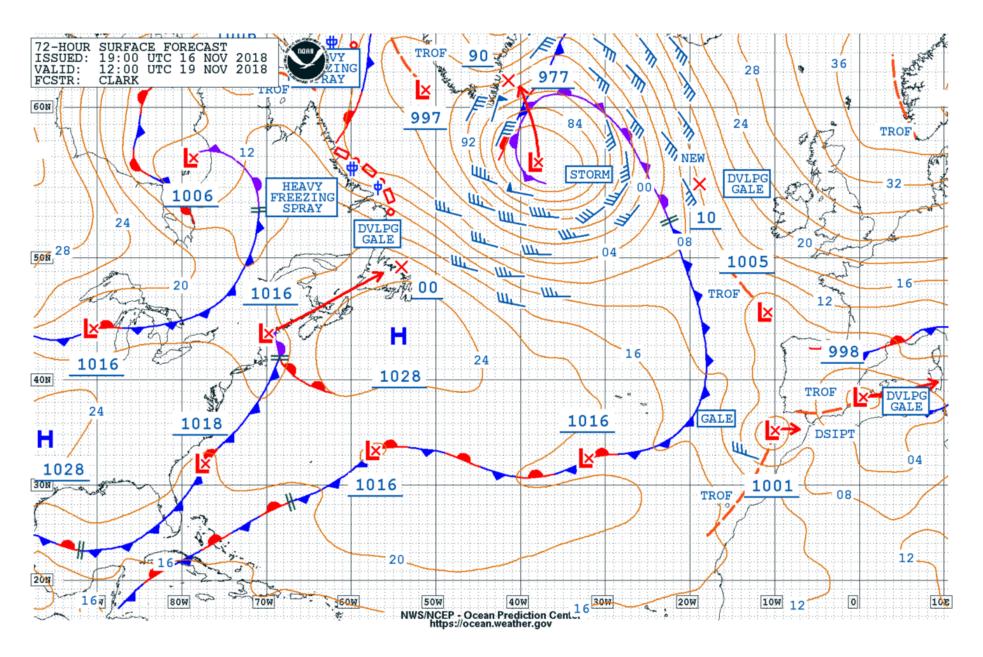
MAP 2: Surface Analysis



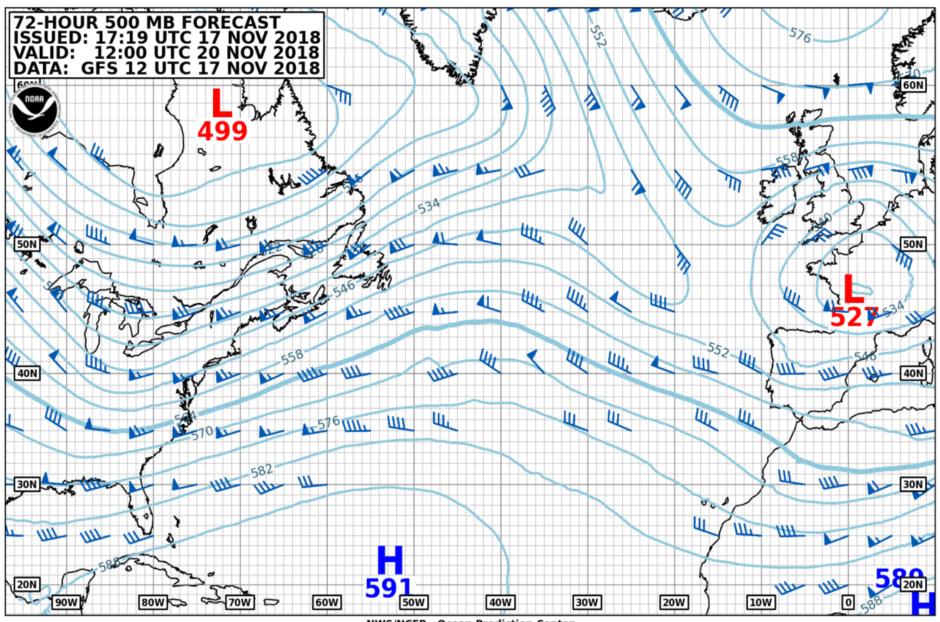
Map 3: Sea State Analysis



MAP 4: 72-Hour Surface Forecast

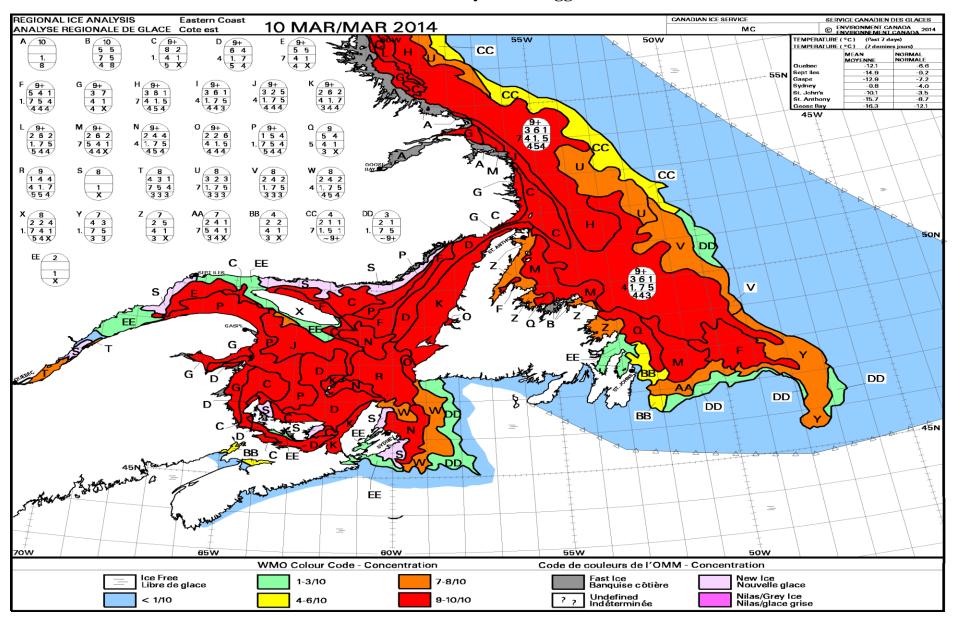


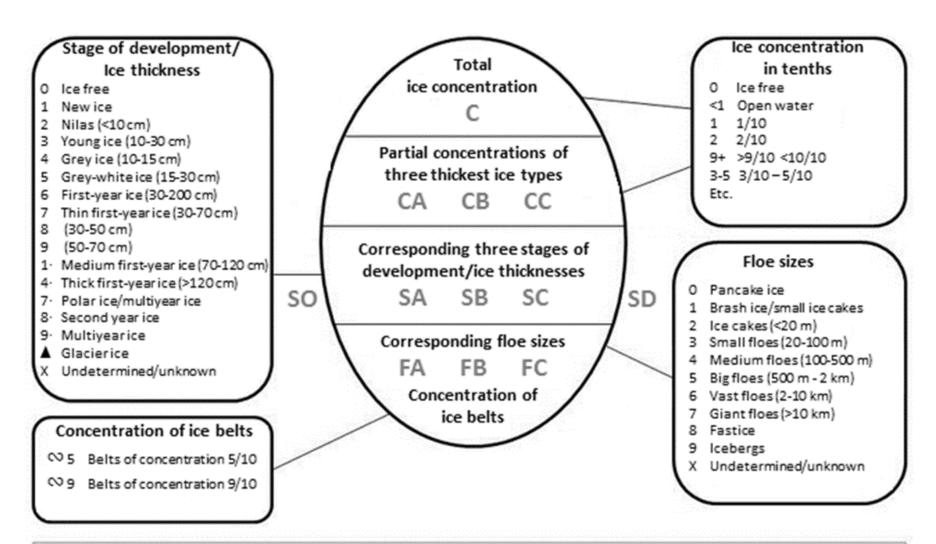
MAP 5: 72- Hour 500MB Forecast



NWS/NCEP - Ocean Prediction Center https://ocean.weather.gov

MAP 6: Ice Analysis and Egg Code





The ice egg may be supplemented by 2 figures:

SO Sporadic (<1/10 concentration) occurences of ice, thicker than indicated inside the egg, may be indicated here.

SO When all partialize concentrations inside the egg total considerably less than the total ice concentration C, the stage of development of the predominant of the remaining thinner ice types may be indicated here.

MAP 7: Iceberg Analysis

