CERTIFICATES OF COMPETENCY IN THE MERCHANT NAVY -DECK OFFICER

STCW 78 as amended CHIEF MATE/MASTER REG. II/2 (UNLIMITED)

032-73 - NAVIGATION

WEDNESDAY, 22 MARCH 2023

0915 - 1145 hrs

Materials to be supplied by examination centres

Candidate's examination workbook UK and Ireland Tide Tables (Edition Sept 2011) Navigation Formulae Datasheet (Version 3.0 March 2019) Nautical Almanac Nautical Tables Pacific and Atlantic Oceans Tide Tables (Edition Sept 2011)

Examination Paper Inserts:

Worksheet Q1(1) - S.Pacific Gnomonic Chart Worksheet Q1(2) - S.Pacific Mercator Chart Worksheet Q3 - Radar Plotting Sheet Worksheet Q4 - Pacific Tide Curve

Notes for the guidance of candidates:

1. Examinations administered by the SQA on behalf of the Maritime & Coastguard Agency.
2. Candidates should note that 200 marks are allocated to this paper. To pass candidates must achieve 120 marks.
3. Non-programmable calculators may be used.
4. All formulae used must be stated and the method of working and all intermediate steps must be made clear in the answer.

Maritime & Coastguard Agency

SQA

NAVIGATION

Attempt ALL questions.

Marks for each question are shown in brackets.

All formulae used must be stated and the method of working and all intermediate steps must be made clear in the answer.

All questions relate to a General Cargo Vessel which is to make passage from Antofagasta, Chile, to Sydney, Australia.

The passage will commence during the month of June. Cargo will be stowed on deck. Chartered service speed 16.0 knots.

1. An initial appraisal of the ocean passage from Antofagasta, 24°00'S 71°00'W, to Sydney, 34°00'S 151°00'E, identifies two possible routes for consideration:

   - A direct Rhumb Line.
   - A Great Circle to South of New Zealand, waypoint 48°00'S 167°00'E, then Rhumb Line to Sydney.

   The direct Rhumb Line route is calculated to be 7289 n.miles.

   (a) Calculate the total ocean passage distance for the route passing South of New Zealand. (20)

   (b) Using Worksheet Q1(1):

   (i) plot the Great Circle passage from Antofagasta to the waypoint South of New Zealand; (4)

   (ii) estimate and state the position of the Great Circle vertex. (6)

   (c) Using Worksheet Q1(2), the given waypoints and the estimated position of the Great Circle vertex obtained in Q1(b), sketch the two ocean passage routes from Antofagasta to Sydney. (15)

   Note - There is no requirement to calculate or plot intermediate waypoints for the Great Circle.

2. The Meteorological and Oceanographic factors are to be appraised for the two possible routes.

(a) Plot on Worksheet Q1(2), for the Southern Hemisphere, EACH of the following:

- pressure systems
- prevailing winds
- currents
- areas of frequent gale force winds
- South Pacific Ocean approximate iceberg limits (20)

(b) With reference to Worksheet Q1(2) and any other relevant meteorological or oceanographic factors, outline the considerations and associated effect on the two routes relating to EACH of the following:

(i) steaming times; (16)

(ii) the Master's obligation regarding planning a safe passage. (14)

(c) The Charterer requires the ship to be weather routed, using a 'Least Time Track'.

During the ocean passage, the ship receives notification of amendments to the route, to maintain the Charterer's required 'Least Time' track. However, the Bridge team's onboard observations of the weather indicate that the proposed track may result in significant onboard damage.

Outline the Master's legal position regarding refusal to comply with the route amendments. (5)

3. During the ocean passage, the OOW calls the Master to the bridge in response to a Mayday message. A sailing vessel in the vicinity has an injured person who requires urgent medical attention.

(a) Outline EACH of the following:

(i) the Master's obligation to assist a vessel in distress; (12)

(ii) the THREE exceptions to the Master's obligation to assist a vessel in distress. (12)

(b) 'Own Ship' diverts to assist the yacht.

At 1535 hrs Zone Time 28th June, VHF communication is established with the yacht. The yacht is instructed to activate its SART to assist in radar detection.

'Own Ship' reduces to manoeuvring speed 14.0 knots.

At 1550 hrs Zone Time, radar detection of the yacht is confirmed, bearing 310°T x 12'.0.

In order to create a lee from the Northerly wind, to enable the safe transfer of the injured person, the yacht is instructed to maintain a course of 270°T at 4.0 knots and advised that 'Own Ship' will take station 5 cables on the starboard beam of the yacht.

Determine EACH of the following:

(i) course of own ship to take up station; (20)

(ii) the ETA, Zone Time, at the 'on-station' position; (6)

(iii) the relative bearing of the yacht when visual contact, predicted at range 5.0 miles, will be made. (6)

4. The ship diverts to Auckland, New Zealand. The injured person will be transferred ashore using the Auckland Pilot Vessel. To rendezvous with the Pilot Vessel the ship will need to cross a shallow water area.

Minimum charted depth of shallow water area 9.1 m.
Draft 9.6 m.
Minimum UKC 1.0 m.

The Admiralty Tide Tables for Auckland state:

Low Water	0235	0.2 m
High Water	0857	2.3 m
Low Water	1348	0.3 m

(a) Determine EACH of the following:

(i) the minimum Height of Tide to cross the shallow water area; (4)

(ii) the predicted time period to safely navigate the shallow water area. (16)

(b) Parallel Indexing will be used to assist with safe navigation during the approach to Auckland.

Outline EACH of the following:

(i) TWO advantages of using Parallel Indexing; (6)

(ii) TWO reasons why Parallel Indexing should not be the only means of position monitoring; (6)

(iii) FOUR considerations for selecting a suitable Reference Point. (12)

CERTIFICATES OF COMPETENCY IN THE MERCHANT NAVY –DECK OFFICER

STCW 78 as amended CHIEF MATE/MASTER REG. II/2 (UNLIMITED)

032-73 - NAVIGATION

WEDNESDAY, 05 JULY 2023

0915 - 1145 hrs

Materials to be supplied by examination centres

Candidate's examination workbook UK and Ireland Tide Tables (Edition Sept 2011) Navigation Formulae Datasheet (Version 3.0 March 2019) Nautical Almanac Nautical Tables Pacific and Atlantic Oceans Tide Tables (Edition Sept 2011)

Examination Paper Inserts:

Datasheet Q1 - Loadline Chart Worksheet Q3 - Ocean Chart Radar Plotting Sheet

Notes for the guidance of candidates:

1. Examinations administered by the SQA on behalf of the Maritime & Coastguard Agency.

2. Candidates should note that 200 marks are allocated to this paper. To pass candidates must achieve 120 marks.

3. Non-programmable calculators may be used.

4. All formulae used must be stated and the method of working and all intermediate steps must be made clear in the answer.

Maritime & Coastguard Agency

SQA

NAVIGATION

Attempt ALL questions

Marks for each question are shown in brackets.

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All questions relate to a Container Ship engaged on a 12 month charter between the USA and Europe.

Service speed 20.0 knots, consuming 45 tonnes per day.

1. The Charterer requires the ship to depart Fort Lauderdale, Florida, with the maximum cargo and to undertake the shortest permissible route, at Service Speed, to Lisbon, Portugal.

   The Master and Navigating Officer are discussing the ocean passage requirements relating to the 'North Atlantic Winter Seasonal Zone II' (NAWSZ). Reference Datasheet Q1.

   The ocean voyage will commence at 26°10'N 80°00'W and requires a Great Circle to its vertex on the southern limit of the NAWSZ and then a Parallel Sailing along the southern limit of the NAWSZ. To assist in the appraisal, further information is required.

   (a) Determine EACH of the following:

      (i) the position of the Great Circle vertex; (12)

      (ii) the distance from Fort Lauderdale to the eastern point of the southern limit (36°N 25°W) of the NAWSZ. (12)

   (b) The ship will commence the ocean passage at 1400 hrs ST, 25th March, and must consume 280 tonnes of fuel to achieve her Winter loadline draught.

      (i) Determine, giving consideration to both the fuel consumption and the steaming time to waypoint 36°N 25°W, whether the ship can enter the NAWSZ prior to arrival at 36°N 25°W (the eastern point of the southern limit of the NAWSZ). (20)

      (ii) Outline the ocean route that will meet the requirements of both the Charterer and the Loadline Regulations. (6)

2. During the final leg of the ocean passage to Lisbon, the ship experiences a failure of the GNSS equipment.

Meteorological forecasts of storm force Westerly winds, heavy rain and associated poor visibility are received.

(a) Explain why the planned landfall at Lisbon should be reassessed. (12)

(b) The predicted landfall will be during the Third Officer's evening watch and the Master would be expected to be on the Navigation Bridge.

State TEN elements relating to making a landfall, with particular reference to the above circumstances, that the Master would discuss with the Junior Officer. (15)

(c) Outline EACH of the following terms:

(i) Nominal Range; (6)

(ii) Luminous Range; (6)

(iii) Geographical Range. (6)

3. Whilst loading cargo for a subsequent voyage, from Miami to Gibraltar, meteorological reports have been monitored regarding the movement of a category 3 Tropical Revolving Storm.

At 1200 hrs UT, 1st August, the centre of the TRS is in position 18º00'N 55º00'W, predicted path 290ºT at 8 knots.

(a) Using Worksheet Q3, plot EACH of the following:

(i) the position of the TRS at 1200 hrs 1st August UT; (3)

(ii) the predicted position of the TRS at 1200 hrs 3rd August UT; (3)

(iii) the potential 'Area Of Influence' for the 48 hours period to 1200 hrs 3rd August. (12)

(b) The ship is programmed to sail at 0700 hrs ST (1200 hrs UT) 2nd August.

The Master and Management Level officers discuss the action required in light of the TRS.

State the validity, outlining the justification, for EACH of the following options:

(i) on departing Miami, undertake the planned passage, passing North of Bahamas and then Rhumb Line 070ºT to Gibraltar; (8)

(ii) on departing Miami, undertake an amended route, initial course NNE to Cape Hatteras; (8)

(iii) on departing Miami, undertake an amended route, initial course SSE, to pass to the South of TRS; (8)

(iv) delay departure, remaining on the berth in the port of Miami. (8)

(c) Further reports state the following:

- 2400 hrs / 1st UT, TRS position 18°30'N 57°00'W.
- 1200 hrs / 2nd UT, TRS position 18°45'N 58°45'W.

The ship will depart Miami at the programmed time.

State, with explanation, the option that a prudent Master would now consider. (10)

4. The accuracy and reliability of Electronic Navigational Chart (ENC) information is vitally important to the Mariner.

(a) State the Datum(s) used for EACH of the following:

(i) Depths; (5)

(ii) Heights, relating to *Drying Heights*, *Vertical Clearance* and other *Elevations*; (8)

(iii) Positions. (4)

(b) Outline the *Survey Source Data* and how the six 'Category of Zone of Confidence' (CATZOG) data is presented on Electronic Navigational Charts. (18)

(c) Define *SCAMIN* (Scale Minimum Value) of an object on an Electronic Navigational Chart. (10)

032-73 NAVIGATION **WORKSHEET Q3** **05 JULY 2023**

(This Worksheet must be returned with your answer book)

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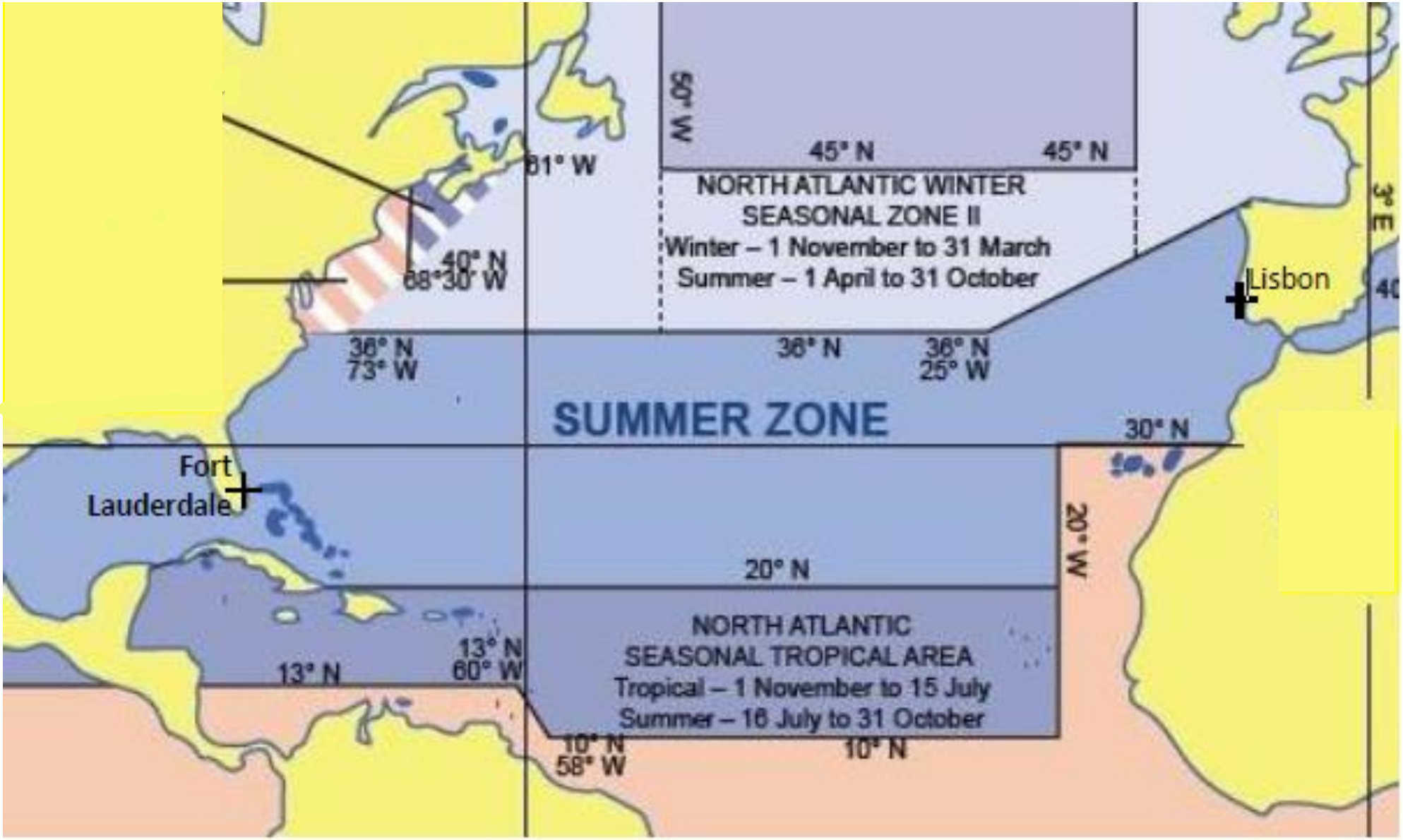
Candidate's Name ..... Examination Centre .....


81° W
60° W
45° N
45° N
NORTH ATLANTIC WINTER
SEASONAL ZONE II
Winter – 1 November to 31 March
Summer – 1 April to 31 October
40° N
68°30' W
Lisbon
3° E
36° N
73° W
36° N
36° N
25° W
SUMMER ZONE
30° N
Fort
Lauderdale
20° W
20° N
NORTH ATLANTIC
SEASONAL TROPICAL AREA
Tropical – 1 November to 15 July
Summer – 16 July to 31 October
13° N
60° W
13° N
10° N
58° W
10° N

CERTIFICATES OF COMPETENCY IN THE MERCHANT NAVY -DECK OFFICER

STCW 78 as amended CHIEF MATE/MASTER REG. II/2 (UNLIMITED)

032-73 - NAVIGATION

WEDNESDAY, 04 OCTOBER 2023

0915 - 1145 hrs

Materials to be supplied by examination centres.

Candidate's examination workbook UK and Ireland Tide Tables (Edition Sept 2011) Navigation Formulae Datasheet (Version 3.0 March 2019) Nautical Almanac Nautical Tables Pacific and Atlantic Oceans Tide Tables (Edition Sept 2011)

Examination Paper Inserts:

Worksheet Q1 - Indian Ocean Datasheet Q4 - Tidal Stream

Notes for the guidance of candidates:

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Maritime & Coastguard Agency

SQA

NAVIGATION

Attempt ALL questions.

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All questions relate to a 185,000 dwt crude oil tanker on passage from Ras Tanura, Saudi Arabia, to Europoort, Netherlands. The planned passage is via the Cape of Good Hope, S. Africa, and the Dover Straits.

Service speed 15.5 knots.

1. The prevailing winds and currents in the North Indian Ocean are subject to changes during the year.

   (a) Describe the formation of the Southwest Monsoon wind. (10)

   (b) Describe the effects of the Southwest Monsoon wind and other influences on the formation of currents in the North Indian Ocean. (10)

   (c) On Worksheet Q1 sketch and name the following Indian Ocean features for the month of JULY:

      (i) the atmospheric pressure systems; (6)

      (ii) the prevailing wind systems; (10)

      (iii) the ocean currents. (10)

2. At 1538 hrs Zone Time, 12th October, the ship is in position 22°30'N 60°00'E and commences the Rhumb Line passage to the Mozambique Channel, waypoint 16°12'S 42°05'E.

   (a) Calculate the course and distance of the Rhumb Line. (15)

   (b) Whilst on passage, Navigation Warnings are received concerning containers lost overboard from a ship.

      Reported position of containers is 15°32'S 42°43'E (assume position static).

      Calculate EACH of the following:

      (i) the distance that the planned track passes due West of the last reported position of the containers; (15)

      (ii) the ETA, Zone Time, at the position due West of the containers. (15)

3. The MCA provides guidance to assist the mariner on navigational requirements.

(a) State the publications that the MCA guidance specify that should be carried to meet the requirements of SOLAS Chapter V Reg 19 - *Carriage requirements for shipborne navigational systems and equipment.* (15)

(b) Outline the current MCA guidance regarding EACH of the following:

(i) precautions and guidance when using Parallel Indexing techniques; (16)

(ii) misalignment and the correction of a Radar Heading Marker. (20)

4. A Voyage Plan requires to be updated during a voyage. This is particularly so during a long voyage, when initial ETAs at navigationally critical points are likely to change considerably.

The updated Passage Plan for transiting the Dover Straits Deep Water route identifies that the ship requires to be in position 51°00'N 1°34'E three (3) hours before the afternoon High Water at Dover, 10th November.

The ship is keeping Netherlands Standard Time in preparation for port arrival.

(a) Determine EACH of the following:

(i) the Ship Time to be at position 51°00'N 1°34'E; (8)

(ii) with reference to Datasheet Q4, the predicted tidal stream at position 51°00'N 1°34'E. (12)

(b) The weather forecast for the Dover Straits indicates frequent heavy rain showers and Northerly winds, force 6 to 8.

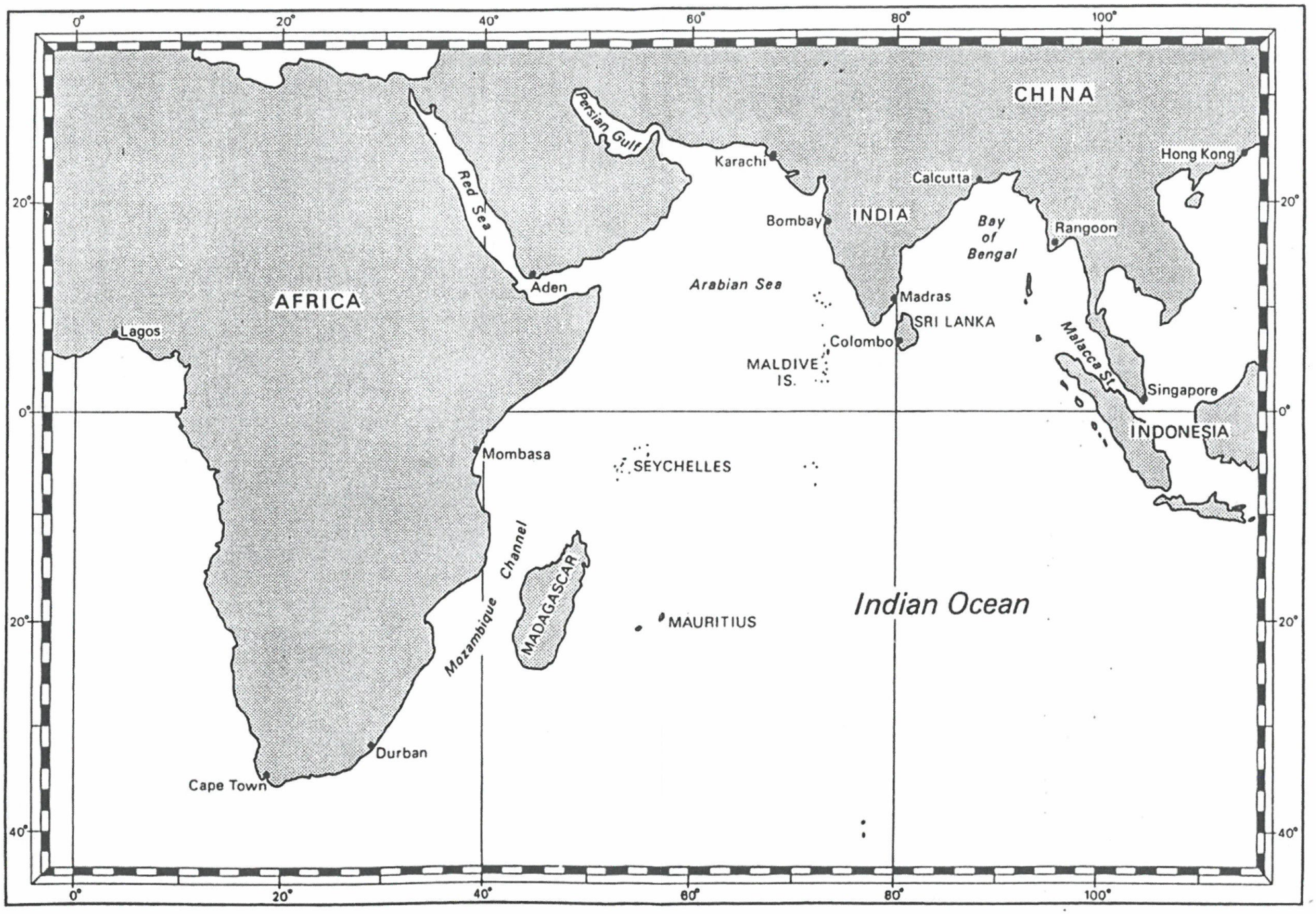
Outline the Bridge Team, stating the duties of each member, for the transit of the Dover Straits. (20)

(c) Tidal information and the Bridge Team requirements are elements of the Execution stage of a Voyage Plan that need to be re-evaluated prior to arrival at critical points of the passage.

Outline SIX other elements relating to the *Execution* stage of the Voyage Plan, that should be updated and amended as necessary, in preparation for the Dover Straits transit. (18)

3 BEFORE HW DOVER

(This Worksheet must be returned with your answer book)



Candidate's Name .....

Examination Centre .....

CERTIFICATES OF COMPETENCY IN THE MERCHANT NAVY –DECK OFFICER

STCW 78 as amended CHIEF MATE/MASTER REG. II/2 (UNLIMITED)

032-73 - NAVIGATION

WEDNESDAY, 29 NOVEMBER 2023

0915 - 1145 hrs

Materials to be supplied by examination centres

Candidate's examination workbook UK and Ireland Tide Tables (Edition Sept 2011) Navigation Formulae Datasheet (Version 3.0 March 2019) Nautical Almanac Nautical Tables Pacific and Atlantic Oceans Tide Tables (Edition Sept 2011)

Examination Paper Inserts:

Worksheet Q1

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Maritime & Coastguard Agency

SQA

NAVIGATION

Attempt ALL questions.

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All questions refer to a general cargo ship on a 12 month charter between Yokohama, Japan and Honolulu, Hawaii, USA. Service Speed 18.5 knots.

1. A Great Circle track is planned for the ocean passages, between waypoints:

   - 35º 25'N 139º 45'E;
   - 22º 10'N 159º 20'W.

   (a) Calculate EACH of the following:

   (i) The ocean passage distance; (15)

   (ii) The position of the track vertex; (15)

   (iii) The required changes to the ship's clocks and date during a west bound ocean passage. (8)

   (b) Sketch on Worksheet Q1, using the given waypoints and calculated position of the vertex, the Great Circle track. (7)

2. During an east bound ocean passage the ship receives information regarding the movement of a Category 2 Tropical Revolving Storm (TRS).

(a) State the months that TRSs usually develop in the North Pacific Ocean. (6)

(b) Sketch a plan view of a North Pacific Ocean TRS, naming all parts. (10)

(c) At 1200hrs/25th UT the National Hurricane Centre reports that the TRS is in position 8° 00'N 175° 30'W with predicted path 290° T, speed 8 knots.
Ship position at this time 35° 02'N 152° 30'E.

Plot, on Worksheet Q1, the 1200hrs/25th positions of the ship and the TRS. (4)

(d) State any immediate amendment to the planned ocean passage that the Master may consider necessary, to ensure the safety of the ship. (3)

(e) At 1200hrs/26th UT the National Hurricane Centre reports that the TRS has strengthened to a Category 3 storm and is in position 10° 30'N 178° 05'W, predicted path 295°T, speed 9.5 knots, Area of Influence 200 – 250 n.mls.

Ship position at this time 34° 05'N 159° 30'E.

Plot, on Worksheet Q1, EACH of the following:

(i) The 1200/26th position of the ship. (2)

(ii) The 1200/26th position of the TRS. (2)

(iii) The TRS 'Area of Influence' during the 48 hours to 1200 hours/28th UT. (10)

(f) In light of the updated information and the plot, state the justification, giving reasons, for EACH of the following possible actions at 1200hrs/26th:

(i) Put the wind on starboard bow of the ship and alter course to starboard as the wind veers, making best speed. (6)

(ii) Continue on the planned Great Circle passage and monitor the National Hurricane Centre reports. (6)

(iii) Steer 180° T to position the ship in the Navigable Semi Circle of the TRS. (6)

3. At 2110 hours ship time, 9th June, ship position 32° 30'N 178° 10'E, a Mayday Relay regarding a yacht in distress is received. Ship keeping the appropriate Zone Time.

The last communication received from the yacht stated that at 0845 hrs UT 9th June, the yacht crew were abandoning the sinking yacht in approximate position 34° 20'N 176° 15'E and taking to the liferaft.

The Master immediately diverts to the last known position of the yacht and orders maximum speed, 19.2 knots.

(a) Calculate EACH of the following:

(i) the bearing and distance to the last known position of the yacht; (8)

(ii) the ETA UT to the last known position of the yacht. (5)

(b) The Master chairs a meeting of the navigating officers to discuss the search operation.

Outline EACH of the following:

(i) SIX factors to consider when determining the Datum Point for the initial search. (12)

(ii) SIX factors to consider when determining the appropriate initial search pattern to be utilised. (12)

(iii) The optimum position to place lookouts when arriving at the yacht's last known position. (10)

(c) Should the initial search be unsuccessful, explain why a Current Rose Chart may be of value when reassessing the Datum Point. (8)

4. The accuracy and reliability of Electronic Navigational Chart (ENC) is vitally important to the Mariner.

(a) State the Datums used for EACH of the following:

(i) Depths; (5)

(ii) Heights relating to EACH of the following:

- Drying Heights; (2)
- Vertical Clearance; (2)
- Elevations; (4)

(iii) Positions. (4)

(b) The function and presentation of the ECDIS information assists the Mariner to maintain safe navigation.

Outline EACH of the following:

(i) 'Safety Contour' function; (8)

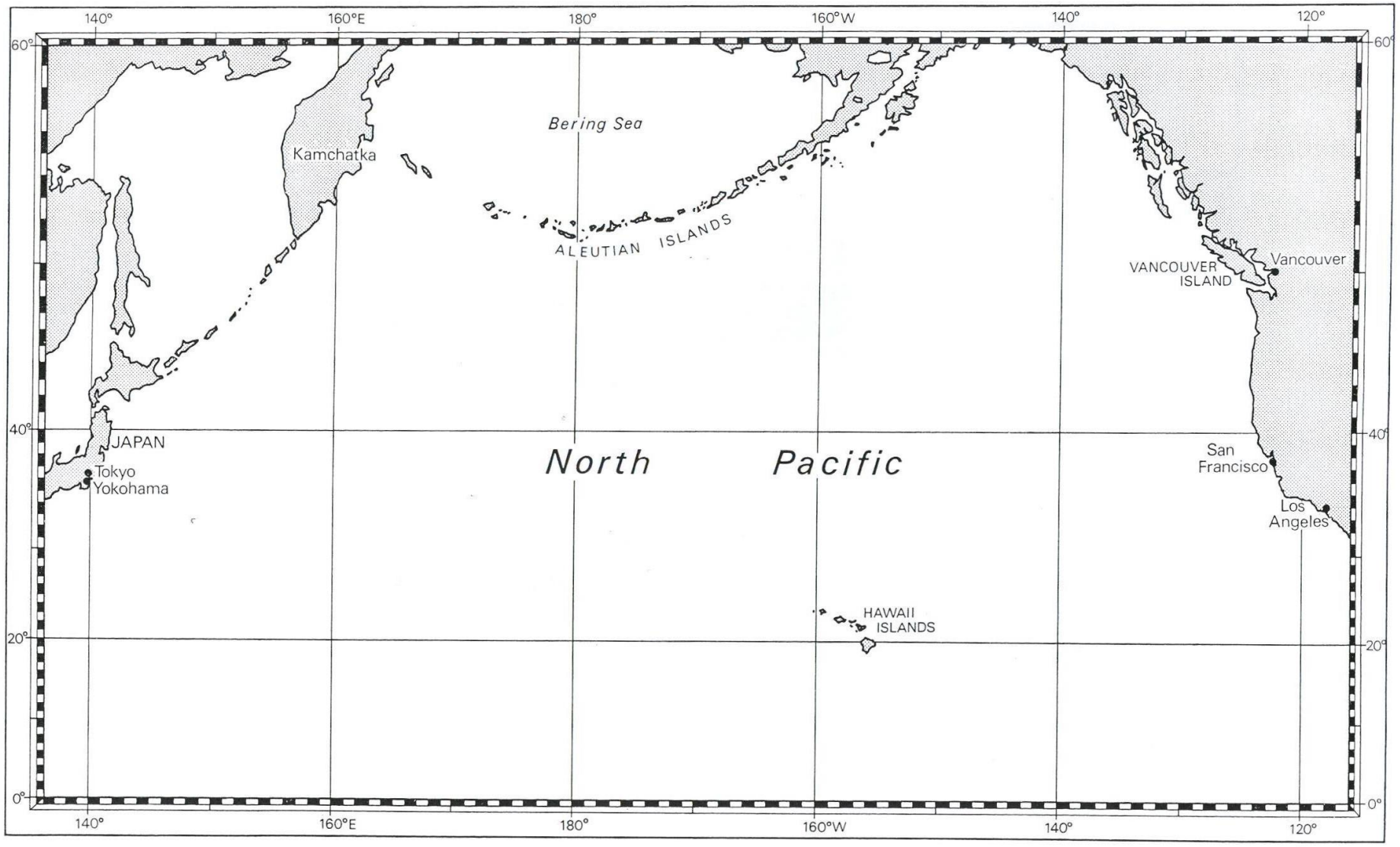
(ii) 'Safety Depth' function; (8)

(iii) TWO benefits of using Scale Minimum Value (SCAMIN). (8)

(iv) The circumstance when the SCAMIN function should not be utilised. (4)

(This Worksheet must be returned with your answer book)

Chart K



Candidate's Name ……..…. Examination Centre ……