MERCHANT SHIPPING SECRETARIAT

GOVERNMENT OF SRI LANKA

CERTIFICATE OF COMPETENCY EXAMINATION

GRADE : CHIEF MATE ON SHIPS OF 500 GT OR MORE (UNLIMITED)
SUBJECT : Navigation
DATE : 18.10.2023

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

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 vessel departs Numea, New Caledonia bound for Concepcion, Chile. The charterer wishes the master to take full advantage of the shortest possible route to Coquimbo. But an ordinary great circle track enters the Winter Load Line Zone whose northern limit is 33^0 S.

   After completion of loading at Numea, the vessel's Winter load line marks are overloaded by 390 ton of fuel and water which must be consumed before entering the Winter Zone. The vessel consumes 32 ton of fuel and water per day, at her service speed of 14.7 knots

   Departure position off Numea: 22º 54' S 167º 06' E
   Landfall position off Concepcion: 36º 48' S 073º 12' W

   Calculate the shortest legal route.

   (35 marks)

2) A vessel is making good a course of 120° (T) at a speed of 12 knots. The DR position at 0630 hrs was 32° 14' S 128° 17' E. Four stars were observed at different times, which gave the following azimuths and intercepts:

Time	Star	Azimuth	Intercept
0618	A	022°	2.2' away
0624	B	127°	2.1' towards
0639	C	185°	3.8' towards
0645	D	333^0	6.5' away

   The same DR was used for all intercepts. Find, by plotting, the vessel's most probable position at 0630 hrs.

   (30 marks)

3) Blind pilotage means the navigation of a ship through restricted waters in low visibility with little or no recourse to the visual observation of objects outside the ship. Answer the following questions with reference to blind pilotage:
   a) Briefly describe the general principals of planning and execution of blind pilotage.
   (08 marks)
   b) Outline the Blind Pilotage **planning** guidelines.
   (15 marks)
   c) Outline the Blind Pilotage **execution** guidelines.
   (12 marks)

4) A vessel trades regularly to the Baltic, where, in the winter months, sea ice and ice accretion may been experienced.
   a) Explain the preparation required for a ship to navigate in Baltic Sea in ice conditions.
   (15 marks)
   b) List the sources from which a master may gain information about ice conditions in the Baltic.
   (05 marks)
   c) Describe five operational problems with regard to navigation in High latitudes.
   (10 marks)

5) Answer the following questions with regard to search and rescue operations:
   a) List the factors to be considered when establishing the search datum
   (12 marks)
   b) What are the factors that will be considered in appointing an On Scene Coordinator (OSC)?
   (08 marks)
   c) Describe the duties of the OSC at the end of a successful SAR operation
   (05 marks)

6) Answer the following questions with regard to TRS:

a) Explain the method of long range avoidance of a Tropical revolving storm with the aid of a sketch showing the Imminent Danger area and Probable Danger Area.

(10 marks)

b) A vessel in position 24°00' S 042°47'E and on a Northwesterly course in to the Mozambique channel receives a radio report that a tropical cyclone is in position 15°00'S 046°00'E has re-curved and is now heading SSW'ly at 15 kts.

i) On the worksheet (Worksheet – 3) provided, plot the position of both the storm and the vessel, show the usual path for such a storm.

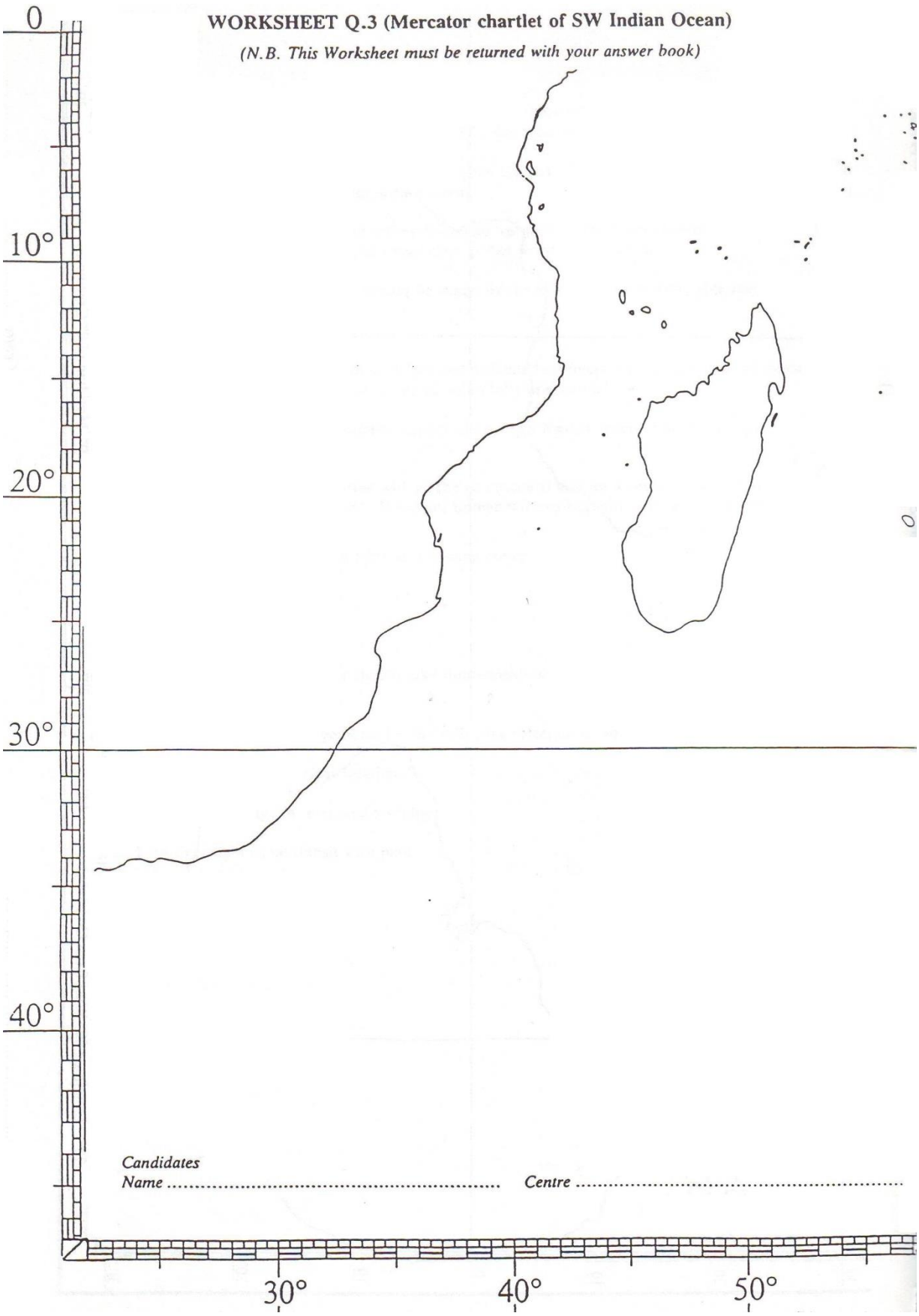
(05 marks)

ii) Describe the alternative routes that could be taken by the master to keep the vessel safe and explain how each could keep the vessel clear of the worst of storm.

(10 marks)

WORKSHEET Q.3 (Mercator chartlet of SW Indian Ocean)

(N.B. This Worksheet must be returned with your answer book)



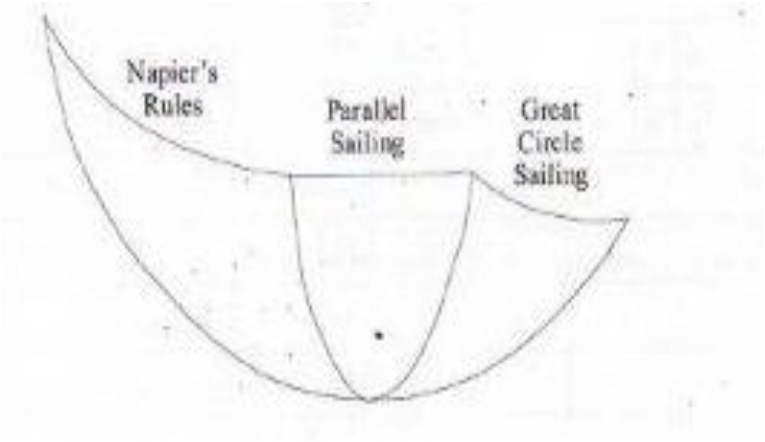
Candidates
Name ..... *Centre* .....

Answers

Answer – 1

Departure position off Charleston	22° 54′ S	167° 06′ E
Arrival position off Vigo	36° 48′ S	073° 12′ W
d′long(P)=119° 42′ E		

Diagram



Dist AVW= (390/32) x 24 x 14.7 =4299.75′

Napier's Rule for PAV;

To Finddist AV
Cos AV = Cos AP/ Cos PV = Cos 67°06′/Cos 57° 00′
AV = 2664.05′

To find P_2
Cos P_1 = Tan PV/Tan AP
= Tan 57° / Tan 67°06′
P_1 = 49° 25.4′

Dist VW = 4299.75′– 2664.05′
= 1635.7′

To find P_2
d′long = dep/coslat = 1635.7′/cos 33°
P_2 =32° 30.35′

To find P_3

$P=P_1+P_2+P_3$
$119^0\,42' = 49^0\,25.4' + 32^0\,30.35' + P_3$
$P_3 = 37^0\,46.25'$

To find dist WB
Cos WB= Cos P_3 x Cos lat W x Cos lat B + Sin lat W x Sin lat B
= Cos $37^0\,46.25'$ x Cos 33^0 x Cos $36^o\,48'$ + Sin 33^0 x Sin $36^o\,48'$
WB=$31^0\,00.52'$
WB=1860.52′

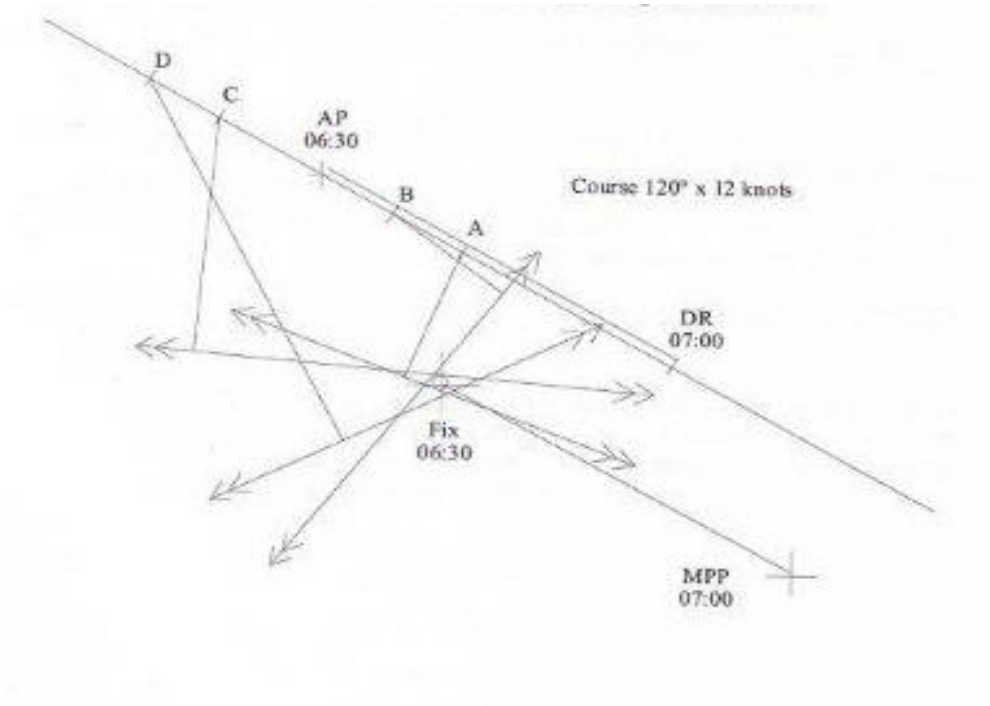
Total dist AB = 4299.75′+ 1860.52′

= 6160.27′

Answer – 2

As the position is required for 0630:

Star A	0618 to 0630	12 minutes	run on	2.4′
Star B	0624 to 0630	6 minutes	run on	1.2′
Star C	0639 to 0630	9 minutes	run back	1.8′
Star D	0645 to 0630	15minutes	run back	3.0′



d' lat = 3.3'S, dep =1.8' E

DR Lat= 32° 14.0' S
d'lat= 0^0 03.3' S
Fix Lat= 32^0 17.3' S

dep = d'long x Cos (m' lat)

d' long = dep / Cos (m' lat)

d'long = 1.8' / Cos 32.3^0
= 2.1'' E

DRLong =128° 17.0 'W
d'long= $0^0$02.1' E
FixLong =128^0 14.9' W

Vessel's Most Probable Position at 1830= 32^0 17.3' S 128^0 14.9' W

Answer – 3(a)

To ensure success, the ship must be accurately navigated along a pre-arranged track. In comparatively unrestricted waters, this is best done by constant fixing using radar in conjunction with other aids such as Decca and echo sounder.

In narrow waters and during the final stages of an anchorage, the delays inherent in fixing are unacceptable to the BPO. It is therefore necessary, for anti-collision and navigation in these conditions, to work directly from the radar display; but it is still necessary to pass radar information for fixing at regular intervals as a safety check and as an insurance against radar failure.

Answer – 3(b)

1. Normal planning considerations for selection of tracks apply. Blind and visual tracks should be the same, to enable the transition from visual to blind or vice versa to be made at any time and also to allow one plan to be used to cross-check the other.

2. The number of course alterations should be kept to a minimum to reduce the work load in redrawing parallel and wheel over lines.

3. Always try to have two parallel index lines where possible, one on each side of the track. These provide a check on measurement, mark identification and can reveal index or linearity errors.

4. Objects to be used both for parallel index lines and for fixing must be carefully selected. They should be radar conspicuous and unchanged by varying heights of tide. Clearly mark on the chart the objects to be used for fixing and brief the assistant. Avoid if possible fixing by radar range and bearing on a single mark.

5. The range scales to be used require careful consideration. Accuracy is greater at shorter ranges but marks pass more quickly than at a distance, requiring more lines to be drawn. When operating on short-range scales, it is essential that the BPO frequently switches to longer ranges to keep aware of developing situations. Changes of range scales and parallel index marks should be pre-planned and marked in the Note Book. The stage at which charts will be changed must also be carefully considered.

6. Tidal streams and currents should be worked out and noted for calculation of courses to steer and for the calculation of EP. These should be displayed on the chart and recorded in the Note Book.

7. Expected soundings (allowing for height of tide and calibration of echo sounder) should be noted for each leg. The possibility of being early or late should also be borne in mind.

8. All hazards along the track should be boxed in by clearing ranges and the ircross-index ranges listed.

9. Details of all lights and fog signals should be taken from the Admiralty List of Lights/chart.

10. The chart should be drawn up using standard symbols,

11. Should contain the full plan, neatly and legibly recorded in chronological order.

13. Clearing range should be simple, safe and easily interpreted.

14. Objects used for wheel overs should be conspicuous, easily identifiable and suitably located adjacent to the track.

Answer – 3(C)

1. Carry out a time check to synchronise clocks and watches.

2. On the radar display, keep one set of parallel index lines drawn up ahead of those in use. Any more will clutter the display excessively. Rub out lines as soon as they are finished with.

3. Identify contacts early (by range and bearing from charted object). An accurate EP is a most useful aid in identification.

4. Fix at frequent intervals and immediately after a change of course. DR/EP ahead. A suitable fixing

5. Ship's speed. One of the factors affecting the choice of ship's speed will be the rate at which the BPO and his assistant are capable of dealing with the radar information.

6. Commentary and conning advice. Maintain a steady, unhurried and precise flow of information to the Command:

- Distance off track/on track/course to maintain or regain.
- Distance and time to next wheel over, new course.
- Present/new course clear of shipping.
- Adjacent marks or hazards, expected lights and sound signals.
- Expected depth and echo sounding. Minimum depths.
- When fixing and result of fix. EP to next alteration.
- Manoeuvring limits (e.g. 5 cables clear to stbd, 1 cable to port).
- If in any doubt, say so and if necessary stop the ship.

7. It must be appreciated that, whatever the technique employed, a drift off line is likely to be detected less readily by radar than by visual methods.

8. It is vital to pay attention to the echo sounder and the least depth expected. The nearest land is usually the bottom

Answer – 4(a)

Need to explain the below:
Ship Preparation
Classification check
Wx reports
Cold wx preparation

Answer – 4(b)

Sailing directions
Mariners handbook
Navtex
Satellite
Baltic wx stations

Answer – 4(c)

Need to describe the below items

Sector lights
Radar range and bearing
Lights house and beacons
GPS
Compasses

Answer – 5(a)

- Reported position and time of the incident
- Time interval between the incident and the arrival of search and rescue facilities
- Estimated surface movement of the distressed craft or survival craft depending on the drift
- Availability of accurate weather and sea conditions at the position of the incident
- availability of drogues/sea anchors to reduce drift
- Type of the craft which will further influence the leeway experienced

Answer – 5(b)

- Experience of the master and officers

- Experience of the crew
- Proficiency in language
- Time that can be spend at the scene
- Facilities available
- Communication facilities
- Maneuverability
- Distance from the scene

Answer – 5(c)

Obtain details of survivors on each participating vessel and report to mission coordinator.
Send details of the ships with survivors and their destinations and eta
Inform the participating vessels of end of operation
Get what action required of the survival craft

Answer – 6(a)