NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2021

NAUTICAL SCIENCE: PAPER II

MARKING GUIDELINES

Time: 3 hours 150 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

SECTION A SEAMANSHIP

QUESTION 1

1.1 The vessel being overtaken is the stand-on vessel and must comply with Rule 17(a); (i) & (ii).

(i) Where one of the two vessels is to keep out of the way, the other shall keep her course and speed.

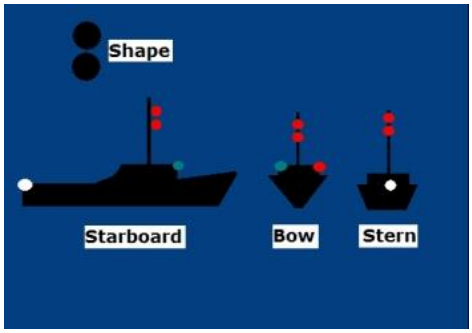
(ii) The latter vessel may, however, take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these rules. In which case she shall not alter course to port for a vessel on her port side (Rule 17(c)).

(iii) The vessel being overtaken may in addition sound at least five short and rapid blasts on the whistle to indicate to the other vessel that he/she is not clear what that vessel's intentions are (Rule 34(d)).

1.2 It means a vessel which from the nature of her work is restricted in her ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel.

1.3 (a) engaged in laying, servicing or picking up navigation marks, submarine cables or pipelines;
(b) engaged in dredging, surveying or underwater operations;
(c) engaged in replenishment or transfer of personnel, provisions or cargo while underway;
(d) engaged in launching or recovering aircraft;
(e) engaged in mine clearance operations;
(f) engaged in a towing operation which restricts the towing vessel and tow in her ability to deviate from her course.

1.4
- Two all-round red lights in a vertical line where they can best be seen;
- Two balls or similar shapes in a vertical line where they can best be seen;
- The red and green sidelights and a stern light when making way.



1.5 Rule 15 – When two power-driven vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel.

QUESTION 2

1. Stop engines.

2. Activate the general alarm and assemble crew.

3. Call the Master.

4. Inform the engine room, ballast and fire pumps ready for use.

5. Display the required lights and shapes, turn the deck lights on.

6. Plot position of the vessel on the chart.

7. Assess the times of the tides and tidal range.

8. Prepare to transmit an emergency message to request assistance.

9. Maintain a rough log of times and incidents. Update the Deck Logbook as soon as possible.

10. Shut and secure all watertight doors and portholes.

11. Prepare anchors.

12. Assemble emergency party to assess damage.

13. Sound all compartments and monitor the ingress of water.

14. Draw up a ballasting and fuel transfer plan.

15. Prepare the lifeboats and rafts for launching.

16. Inform the owners, charterers and coastal authorities.

The list should be in order of priority, any or all of the above actions or any other relevant actions.

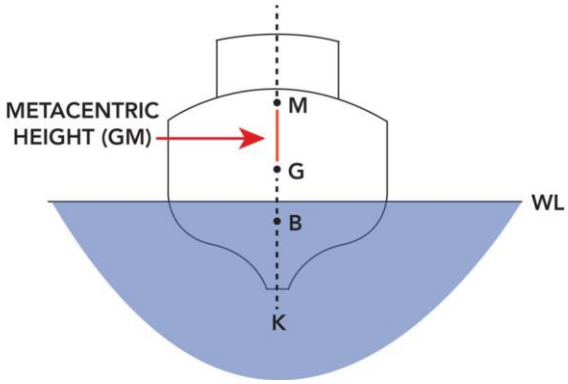
QUESTION 3

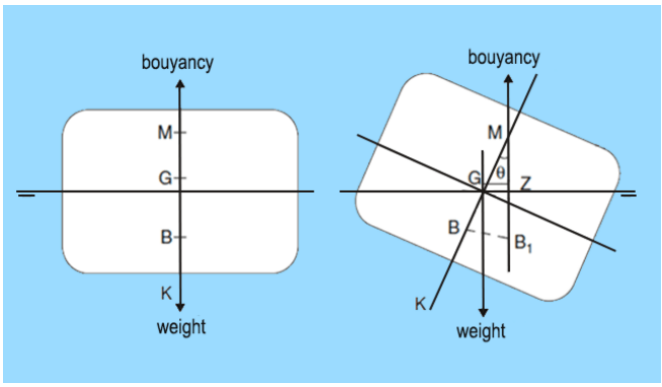
3.1 The vertical lines through the centre of buoyancy (B and B¹) at two consecutive angles of heel intersect at a point called the metacentre. For angles of heel up to 15º the vertical through the centre of buoyancy may be considered to cut the centre line at a fixed point called the initial metacentre (M).

3.2 The vertical distance between the centre of gravity (G) and the metacentre (M) is referred to as the metacentric height (GM). If G is below M the ship is said to have a positive GM, and if G is above M the metacentric height is said to be negative.

3.3 A ship is said to have a stable equilibrium if, when inclined, she tends to return to the initial position. For this to occur, G must be below M, that is, the ship must have a positive initial metacentric height.

Diagrams/sketches





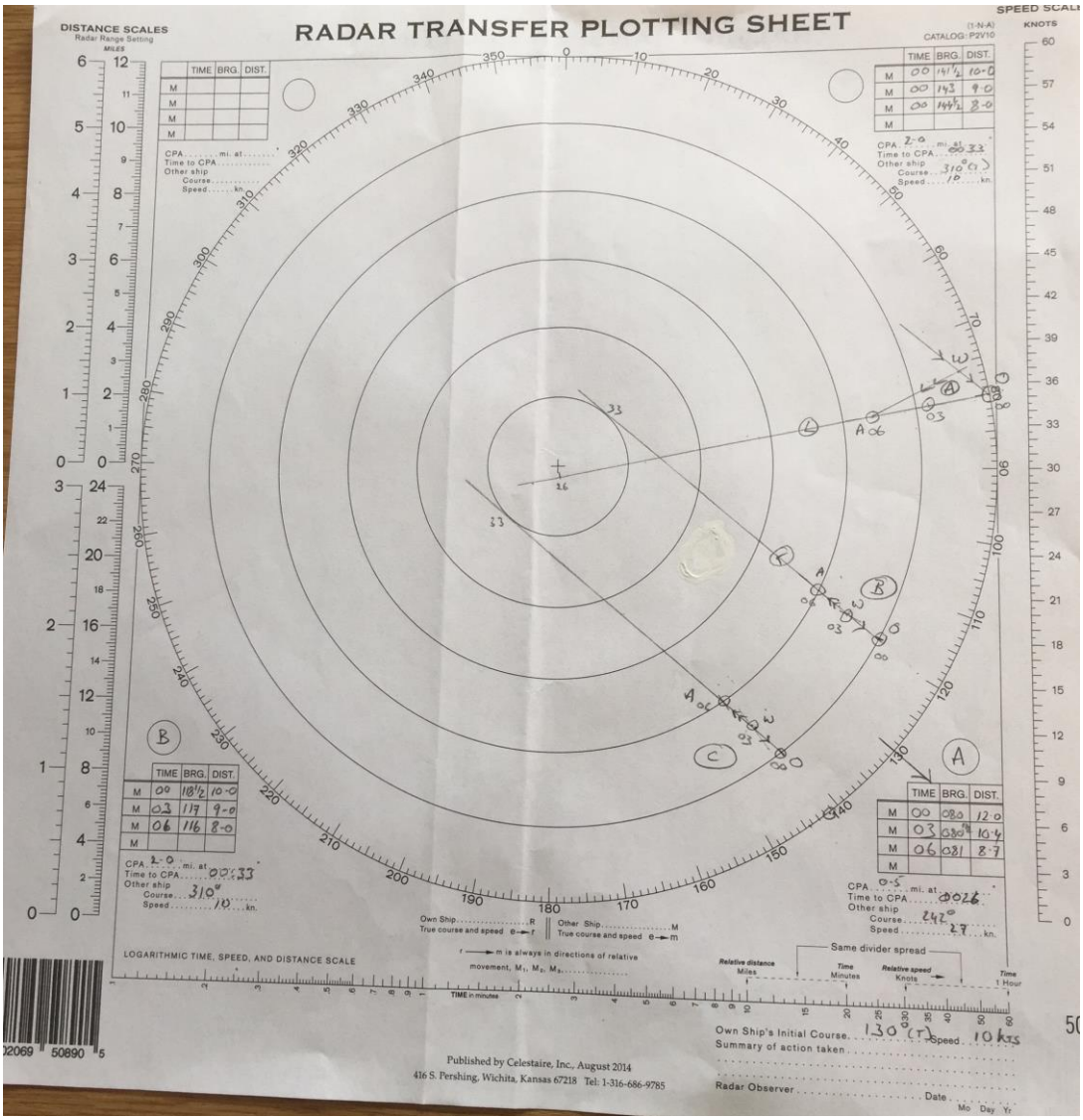
QUESTION 4

4.1 See the attached plotting sheet.

4.2

Target 'A'	TCPA	00:28 distance 0,5 miles
	Target course	220 º (T) at 13,5 knots
Target 'B'	TCPA	00:33 distance 2,0 miles
	Target course	Stationary (probably a buoy)
Target 'C'	TCPA	00:33 distance 2,0 miles
	Target course	Stationary (probably a buoy)

4.3 Target 'A' is crossing ahead from the port side on a course of 220 º (T) at 13,5 knots and the CPA will be less than 1 mile. Therefore, own vessel action to take, keeping within the buoyed channel, will be to reduce speed from 10 knots to 5 knots, and if required reduce to minimum speed to maintain steerage. Continue monitoring all targets until the danger is over and they are past and clear.



QUESTION 5

5.1 Features of a Ro-Ro ship:

- The prime feature of a Ro-Ro vessel is that cargo can be loaded on and off on wheels by trailers or in trucks, and can be moved around within the vessel to be stowed on or off the wheeled transport.
- Has a ramp on the stern or quarter for driving cargo on and off the vessel. On some vessels the ramps are on the side.
- Internal fixed and/or closing ramps to access different deck levels.
- Equipped with a set of mobile cargo-handling equipment such as forklifts, container stackers, low-bed trailers and mechanical horse or tractors for towing the trailers.
- Multi-decked interlinked by ramps. In some cases there may be lifts or hoists to move from one deck to the next.
- The vessels are normally self-supporting and not reliant on equipment or infrastructure from ashore.
- Capable of handling large or small parcels of cargo including containers and heavy lifts or abnormal size cargo.

5.2 Reefer vessel

- A vessel designed to carry refrigerated cargo such as perishable fruit and meat.
- It is a multi-hatch/hold (usually four or five) and multi-deck vessel designed for palletised cargoes.
- Fitted out with cranes of capacity up to 25 tons.
- Holds are insulated. Each deck and each hold temperature controlled from –20 °C to ambient temperature.
- The more recently designed reefer vessels also carry integral reefer containers on deck and have larger crane capacity (35 t) to handle the containers.

SECTION B COMMUNICATIONS AND METEOROLOGY

QUESTION 6

6.1 An "Urgency" message indicates that the **station transmitting it has urgent information concerning the safety of the vessel or persons**. It is only sent on the **authority of the Captain**. The urgency message will have **priority over all other communications except distress/Mayday**. The transmission **should not be interrupted or interfered with**.

6.3 MF on 2182 kHz
VHF on Channel 16 or 156.8 MHz

6.4 Silent periods on 2182 kHz voice:
- Every hour, beginning on the hour and lasting for three minutes.
- Every half hour, beginning on the half hour and lasting for three minutes.

QUESTION 7

7.1 Wind is the movement of air from a high pressure to a low pressure.

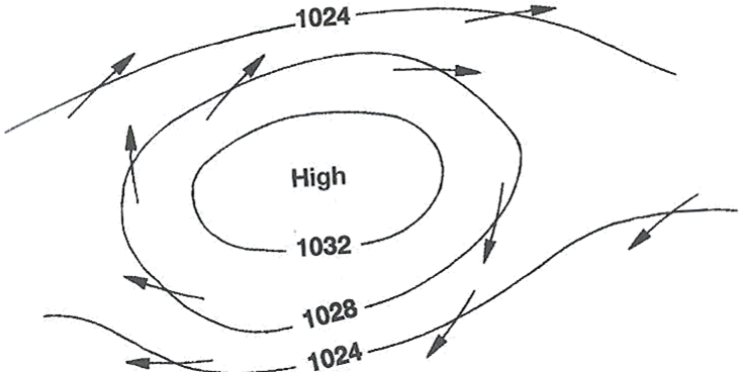
7.2 Geostrophic or Coriolis.

7.3 Right or anti-clockwise from the high-pressure centre.
Buys Ballot's Law – If, in the northern hemisphere, an observer faces the wind, pressure is lower on his right hand than on his left whilst the converse is true in the southern hemisphere.

7.4 An anticyclone is a region of high pressure surrounded by an area of relatively low pressure.

The isobars are circular or oval in shape.

In the northern hemisphere, the wind circulates in a clockwise direction round the centre of the high pressure.



SECTION C SAILINGS

QUESTION 8

8.1

	LAT	Mid-LAT	LONG
Own ship	31º 06' S	31º 06' S	013º 35' E
Distress position	26º 34' S	26 º 34' S	006º 14' E
D.Lat/D.Long	4º 32' N	57º 40'	7º 21' W
Mid-Lat	272' N	28º 50'	441' W

Dep. = D.Long × Cos M.Lat	441 × Cos 28º50'	Dist. = DLat/Cos Co	272/Cos 55º	
	386,328	Distance to distress	**474,0 Miles**	
Tan Co.= Dep/D.Lat	386,328/272			
	1.4203253			
Course	N55ºW			
Course to distress =	**305º (T)**			

8.2 Steaming time @ 22 kts Dist./Speed
474/22
21,545 hrs
0,8977 day

Fuel consumption 74 × 0,8977
Consumption = **66,4 tons**

Marking Note *– Some had answered this using Meridional Parts instead of Mid-Lat. This was accepted with the following calculated answers being very close to the above:*

Course = 305º (T)
Distance = 474,2 miles
Consumption = 66,4 tons.

QUESTION 8 – Meridional parts

8.1

	LAT	MP	LONG
Own ship	31º 06' S	1952,93	013º 35' E
Distress	26º 34' S	1643,93	006º 14' E
DIF	4º 32' N	309	7º 21' W
	272' N		441' W

Tan course = D'Long/DMP
= 441/309
= 1,427184466
Course = N55ºW = 305º (T)

Distance = D'Lat / Cos. Course
= 272º / Cos 55º
= 474,2 miles

8.2 Consumption
66,4 tons.

Total: 150 marks