NATIONAL SENIOR CERTIFICATE EXAMINATION
MAY 2023

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.

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SECTION A SEAMANSHIP

QUESTION 1

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

1.2 Fog signals:

(a) One prolonged blast at intervals of not more than two minutes. (Rule 35a)

(b) Two prolonged blasts in succession at intervals of not more than two minutes, with an interval of about two seconds between them. (Rule 35b)

(c) A vessel engaged in towing or pushing (not rigid) another vessel shall sound at intervals of not more than two minutes three blasts in succession, namely one prolonged followed by two short blasts. (Rule 35c)

(d) A vessel of less than 100 m in length at anchor shall at intervals of not more than one minute ring the bell rapidly for five seconds. (Rule 35g)

1.3 The term 'restricted visibility' means any condition in which visibility is restricted by fog, mist, falling snow, heavy rainstorms, sandstorms and any other similar causes. (Rule 3l)

1.4 Every vessel shall at all times maintain a proper lookout by sight as well as by hearing as well as by all available means appropriate to the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision. (Rule 5)

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QUESTION 2

1. Raise the alarm;

2. Check for any injured or trapped personnel in the vicinity;

3. As far as possible shut off vents, close doors and windows, and reduce the air supply to the compartment and adjacent compartments;

4. If the fire is small enough, and only with the aid of a second person (not alone), use the fire appliances in the vicinity to attempt to extinguish (or control) the fire;

5. Report the incident/situation to the bridge or control room;

6. Run fire hoses and prepare for boundary cooling;

7. Account for all personnel, roll call;

8. Isolate all power to the area.

Answer may contain any five of the above listed, or any other relevant actions.

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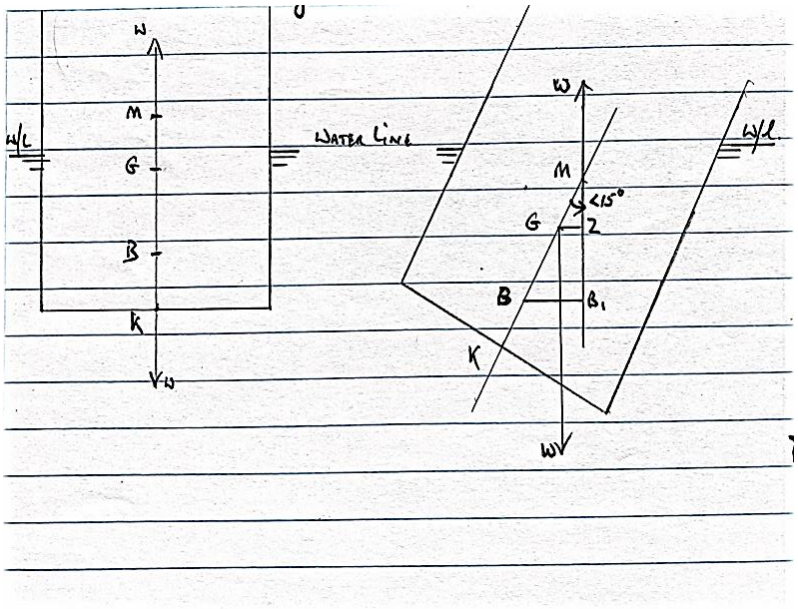
QUESTION 3

(a) The vertical line through the centre of B, and the vertical line through the centre of B^1, when the vessel is at an angle of heel, will intersect at a point called the metacentre.
For angles of heel up to 15° the verticals through the centre of buoyancy (B) may be considered to cut the vertical centre line at a fixed point called the Initial Metacentre (M).

(b) The vertical distance between the centre of gravity (G) and the metacentre (M) is referred to as the meatacentric height (GM). If G is below M the vessel is said to have a positive GM, and if G is above M the vessel will have a negative GM.

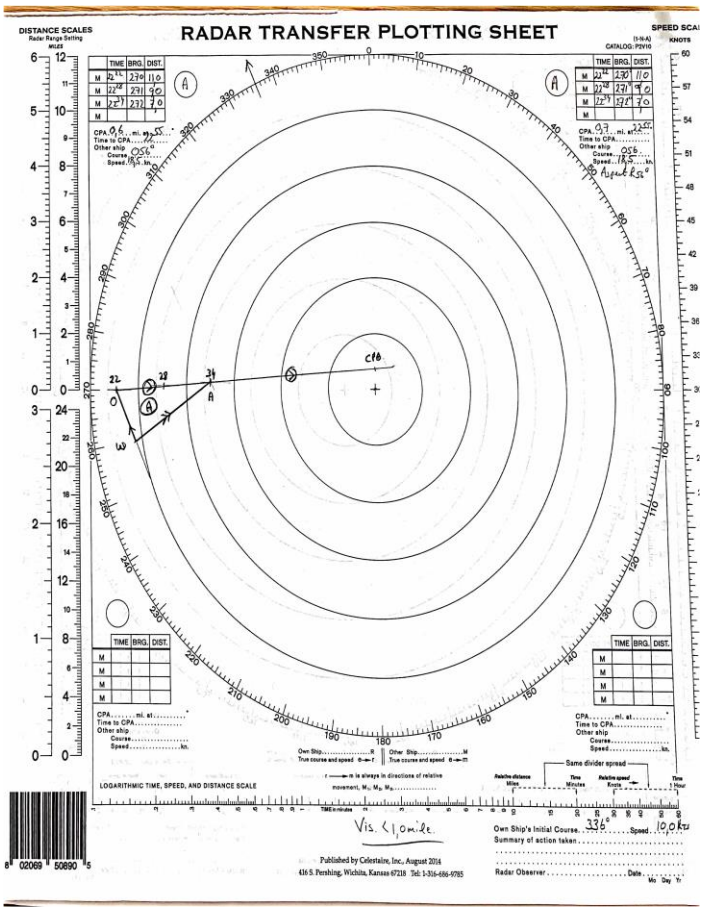
(c) A vessel is said to have a stable equilibrium if, when inclined, she tends to return to the initial upright position. For this to occur, G mus be below M, that is, the ship must have a positive intial GM or metacentric height.

(d)



QUESTION 4

4.1



4.2 Target 'A'

Initial plot & Range	22:22, 11,0 miles
Heading of 'A'	056° (T)
Speed of 'A'	18,5 kts
CPA	0,6 miles
TCPA	22:55
Aspect	R56°

4.3 To avoid a close quarters situation reduce speed to 6 knots, and/or alter course to starboard to steer 036° (T) to increase the CPA to 2 miles.
Continue to plot or monitor the target, and if the alteration alone does not achieve the desired effect, then reduce speed to a minimum steerage and navigate with caution.

Either alteration of course to starboard or reduction of speed are acceptable answers.

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QUESTION 5

5.1 Bulk carriers are generally single deck, multi-hold (4-9 hatches/holds) designed normally to carry a full shipload of one commodity in bulk (iron ore, coal, wheat, etc.).

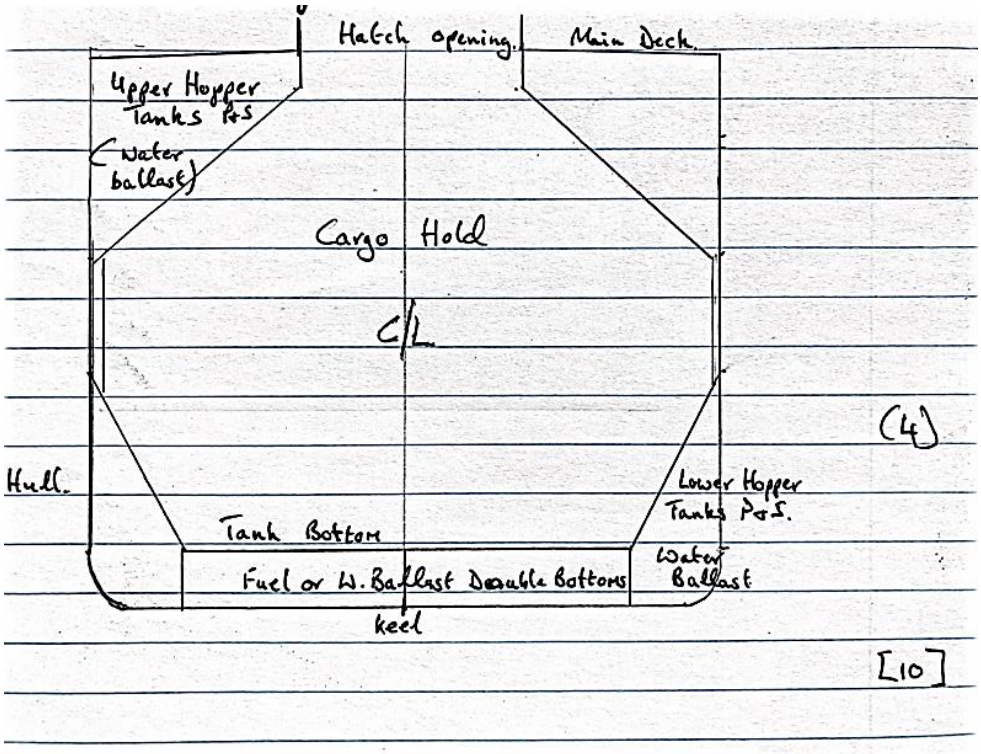
There are large hatch openings through which the cargo is tipped or poured into the hold. The discharge is normally by grab or suction depending on the nature of the commodity.

The holds are designed for self-trimming and easy handling of cargo with minimum labour.

The vessel may be 'geared', meaning equipped with cranes or its own mechanical handling equipment, or it will be 'gearless' (no equipment).

The vessel will have a comprehensive ballast system for fast and powerful pumping and distribution of water for purposes of trim and stability as well as draft and air draft.

5.2



SECTION B COMMUNICATIONS AND METEOROLOGY

QUESTION 6

6.1 A safety message is used in circumstances where the transmitting station or sender has an important navigational or meteorological warning to transmit.

It is a message containing important or vital information about navigation and/or weather in a specific area.

6.2 Example of a 'Safety' message:

SECURITE SECURITE SECURITE
This is Motor Vessel MSC JADE, MSC JADE, MSC JADE
Experiencing severe abnormal seas in excess of 3 metres in the vicinity about 12 miles east of Port St John's
OUT

6.3 Following protocols for radio communications:

1. Do not transmit during silence periods;
2. Listen for any other traffic on the frequency before calling so as not to interrupt other traffic;
3. Call on the calling frequency for a maximum of one minute only;
4. Change to a working frequency to send your message;
5. If a distress, urgency or safety message is received while you are busy on the radio, stop your transmission and pay attention to the message;
6. Prepare your message before transmitting;
7. Speak clearly using phonetics;
8. Spell out names, letters and numerals using phonetics;
9. Do not use abusive language;
10. Use names and call signs of stations, not personal names.

Answer may contain any five of the above, or any other relevant or appropriate answer.

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QUESTION 7

7.1 Meteorological resources available to the seafarer:

1. Maritime coastal radio station;
2. Navtex;
3. Satellite GMDSS Inmarsat C;
4. South African Weather Services (SAWS);
5. Port Met. Office (local Airport);
6. Port Control;
7. Met. instruments on board and watchkeepers observations;
8. Regional commercial radio and TV stations;
9. Internet browser (www.weather)

Answer may contain any five of the above, or any other relevant or appropriate answer

7.2 Heat is transferred from the earth to the atmosphere by:

1. RADIATION – The earth's surface is heated by shortwave radiation from the sun, and it in turn radiates to the atmosphere heat by longwave form.
2. CONDUCTION – Air in contact with the earth is warmed during the day and cooled at night.
3. CONVECTION – Air which is warmed expands and is less dense causing it to rise above more dense cold air. Thus large amounts of warm air and water vapour rises to upper by convection. Most of the atmosphere heating takes place by convection.
4. TURBULANCE – Air flowing over rough or uneven surfaces (rocky or mountainous areas) tends to be deflected upwards. The rising air carries its warmth and the falling air brings its coolness.

Answer may contain any three of the above

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

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SECTION C SAILINGS

QUESTION 8

8.1

	Lat.	Mid-Lat	Long.
Pos. 'A'	32° 16' S	32° 16'	028° 10' E
Pos. 'B'	34° 05' S	34° 05'	027° 00' E
Dif.	1° 49' S	66 21'	1° 10' E
Mid. Lat.		33° 10' S	
	109' S		70' W

Dep = D'Long × Cos 70 × Cos33.17
M.Lat 58,596

Tan Co. = Dep /D'Lat. 58,596 / 109

0,53758

Course = 208° (T) **S28°W**

Distance = D'Lat/Cos Co. 109 / Cos 28°
Distance = **123,5 miles**

8.2 Steaming time A to B 123,5/15,5
Time = **7hrs 58m** **or 8hrs.**

QUESTION 9

Parallel sailing is a calculation of distance along a parallel of Latitude where the Departure (distance in nautical miles) is equal to the D'Long × Cos. Lat.

Plane sailing is the calculation of course and distance between two positions of different latitude and longitude. This calculation is limited to small distances of not more than 600 miles.

Total: 150 marks

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