NATIONAL SENIOR CERTIFICATE EXAMINATION
SUPPLEMENTARY EXAMINATION – MARCH 2018

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 1.1.1 The pilot vessel must keep clear of both the trawler and the yacht. (3)

1.1.2 The trawler is the stand-on vessel in respect of both the pilot vessel and the yacht. (3)

1.1.3 The yacht must keep clear of the trawler, but she is the stand-on vessel in respect of the pilot vessel. (3)

1.2 1.2.1 Tug towing another vessel in fog should sound at intervals of not more than 2 minutes three blasts in succession, namely one prolonged followed by two short blasts. (4)

1.2.2 A vessel of 100 m or more in length at anchor in fog should, at intervals of not more than 1 minute, ring the bell rapidly for about 5 seconds in the fore part of the vessel, immediately followed by the sounding of a gong for about 5 seconds in the aft part of the vessel. (7)

1.2.3 To warn of your vessel's anchor position to another vessel, sound 3 blasts in succession, namely one short, one prolonged and one short blast. (4)

1.3 A vessel engaged in fishing will display two all-round lights in a vertical line, the upper being red and the lower white. A shape consisting of two cones with apexes together in a vertical line, one above the other. Also the red and green sidelights and the stern light of a vessel underway.

DAY SIGNAL V/L ENGAGED IN FISHING (6)

[30]

QUESTION 2

1. Raise the alarm. (2)

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

3. If the fire is small enough, and only with the aid of a second person, use the fire appliances in the vicinity to attempt to extinguish the fire. (2)

4. As far as possible shut off vents, close doors and windows, and reduce the air supply to the compartment and adjacent compartments. (2)

5. Report the situation to the bridge or control room. (2)

6. Run fire hoses and prepare for boundary cooling. (2)

7. Ascertain if there is anyone trapped or injured in the area. (2)

8. Isolate all power to the area. (2)

Any 5 **[10]**

QUESTION 3

3.1 The vertical lines through the centre of buoyancy (B, 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). (7)

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. (7)

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.

(6)

[20]

QUESTION 4

4.1 See the attached plotting sheet. (8)

4.2

1.	Contact ID	'Y'	see attached plotting sheet
2.	Time of 1st plot	22:22	
3.	Initial range	11 miles	
4.	Heading of target	058º (T)	
5.	Speed of target	19 knots	
6.	CPA	0,6 miles or 6 cables ahead	
7.	TCPA	22:55	(7)

4.3 To avoid a close quarters situation I would reduce speed to 6 knots or alter course to starboard to course 036° (T) to increase the CPA to 2 miles. Continue to plot the vessel, and if the alteration of course alone does not achieve the desired effect, then reduce speed to a minimum but maintaining steerage and navigate with caution. Continue to sound the fog signal of one prolonged blast at intervals not exceeding 2 minutes. (5)

[20]

RADAR PLOTTING SHEET

Date: .....

Range: .....

Rings: .....

Ships Course: 336°(T)

Ships Speed: 10 knots

Head Up ☐

Course Up ☐

North Up ☐

Contact ID: "y"	Contact ID:	Contact ID:
Time of First Plot: 2222	Time of First Plot:	Time of First Plot:
Initial Range: 11m.	Initial Range:	Initial Range:
Heading: 058°(T).	Heading:	Heading:
Speed: 19 knots.	Speed:	Speed:
CPA: 0,6' at: 22.55.	CPA: at:	CPA: at:

EXAMINATION NUMBER: .....

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AMBERLEY
marine
TEL: 0623 926104

Part No. AMB PS001

QUESTION 5

Bulk carriers are single deck, multi-hold (4–9 hatches/holds) designed to normally carry one commodity (e.g. iron ore, coal, grain) loaded in bulk. The holds are designed with large hatch openings through which the cargo is tipped or poured into the hold, and discharged using grabs, or in some cases for light cargoes (grain) by evacuators or suction.

The holds are designed for easy loading, self-trimming and minimum manpower or mechanical stowage. On discharge, grabs or conveyor systems remove almost all the cargo with minimum manpower (shovelling) or mechanical means (Bobcats) for final sweeping or cleaning.

The vessel may be 'geared' or 'gearless', meaning it will either be equipped with cranes and grabs for loading/discharge, or it will have no equipment and rely entirely on terminal equipment to handle the cargo.

The vessel will be designed to have a comprehensive ballast system for trim and stability purposes. The ballast will also be used to manage the draft and air-draft requirements at the ports and terminals. (6)

(4)
[10]

90 marks

SECTION B COMMUNICATIONS AND METEOROLOGY

QUESTION 6

6.1 A safety signal or message is used when the transmitting station has an important navigational or meteorological warning to transmit. (4)

6.2 SECURITE SECURITE SECURITE (2)

THIS IS M V MSC JADE MSC JADE MSC JADE (1)

EXPERIENCING SEVERE SEA STATE AND ABNORMAL HIGH (1)
AND DANGEROUS WAVES IN POSITION 12 MILES EAST OF PORT ST JOHNS (1)

OUT (1)

6.3 Good operating practices when making a radio call:
1 – Do not transmit during silence periods.
2 – Listen before calling to ensure that there is no distress traffic in progress, and that you are not interrupting any other communications.
3 – Call on the calling frequency for no longer than 1 minute.
4 – Change to a working frequency to send your message.
5 – If a distress, urgency or safety message is received while operating radio equipment, stop and listen to the call and the message.
6 – Prepare the message before transmitting.
8 – Speak clearly and deliberately.
9 – Use the phonetic alphabet and spell out and clarify names, letters and numerals.
10 – Transmit important groups of numbers singly and phonetically.
11 – Do not use abusive or foul language.
12 – Use the names and call signs of the stations you are communicating with, not personal names. (5)
Any 5 **[15]**

QUESTION 7

7.1 Warm air moves faster than cold air and every now and again forces its way into the cold air causing a bulge in the polar front. This is the commencement of a FRONTAL DEPRESSION. The warm air, which is less dense, pushes into the more dense, colder air, and the pressure falls. As the depression develops, the cold air cuts in behind the warm air (cold front) moving faster than the air in the warm sector now ahead. As a result, the warm sector is undercut and lifted off the surface. The front is then said to be OCCLUDED.

The air temperature changes with the passage of time. If the air behind the occluded front is colder than that in the front, the occlusion is called a COLD FRONT. The opposite is if the air behind is warmer; then it is a WARM FRONT. A cold front is marked by a rise in atmospheric pressure, a fall in temperature and dew point, and the wind will veer (change direction clockwise). Rain usually occurs and may extend 50–100 miles ahead or behind the front. Heavy showers at the front. Thunder may occur.
See attached illustrations. (15)

7.2 The hygrometer consists of two thermometers mounted side by side in a specially constructed and ventilated box called a 'Stevenson Screen'. The one is a standard thermometer called the 'dry bulb'. The other thermometer, called the 'wet bulb', has attached to the mercury bulb at the bottom a muslin or cambric sock covering. From this, there is a wick into a small reservoir of distilled or condensed water.

The hygrometer is used to measure the humidity of the air or dew point for the purposes of predicting and managing fog as well as for ventilation control and cargo management. (5)

[20]

Figure 60 The lite of a frontal depression

Figure 60 Plan of southern hemisphere frontal depression

35 marks

SECTION C SAILINGS

QUESTION 8

8.1

	Lat.	Mid. Lat.	Long.
'A'	33º 15' S	33º 15' S	028º 00' E
'B'	34º 00' S	34º 00' S	026º 00' E
Dif./Mid.	0º 45' S	67º 15'	2º 00' W
	45' S	33º 37,5'	120' W

Dep = D'Long × Cos m. Lat.
= 120 × Cos 33º 37,5'
Dep = 99,924

Distance = d.Lat ÷ Cos Co.
= 45 ÷ Cos 65¾º
= 45 ÷ 0,4103
Distance = 109,6 miles.

Tan course = dep ÷ D'Lat
= 99,924 ÷ 45
= 2,221
Course = S65¾º W
Course = 245¾º (T) (15)

8.2 At 18½ knots, dist. 109,6M, steaming time 5 hr 56 min. (5)
[20]

QUESTION 9

Plane sailing is used for small distances of less than 600 nautical miles.

Mercator sailing is used for greater distances, and uses the difference in meridional parts (DMP) for two latitudes.

The reason for this difference is because the meridians are projected on a flat Mercator chart as perpendicular to the lines of latitude, when in fact they should converge. Therefore the scale on a Mercator chart is increasingly distorted moving away from the equator.

[5]

25 marks

Total: 150 marks

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