



**MERCHANT SHIPPING SECRETARIAT
GOVERNMENT OF SRI LANKA**

CERTIFICATE OF COMPETENCY EXAMINATION



GRADE : OFFICER IN CHARGE OF A NAVIGATIONAL WATCH ON SHIPS OF
500 GT OR MORE (UNLIMITED)
SUBJECT : PRINCIPLES OF NAVIGATION
DATE : 27.10.2023

Time allowed THREE hours

Total marks : 180

Answer all questions

Pass marks : 60%

Formulae and all intermediate steps taken in reaching your answer should be clearly shown.
You may draw sketches wherever required.

1) a) Describe the following;

- i) Civil Twilight
- ii) Nautical Twilight
- iii) Astronomical Twilight

(09marks)

b) Explain which Twilight region is suitable to take star observations for navigation.

(05 marks)

c) What are the conditions that must be satisfied for twilight to last all night?

(06 marks)

2) a) List down Inferior and Superior Planets.

(07 marks)

b) Explain the Apparent motion of the planet Jupiter.

(05 marks)

c) The moon was having following elongations. Explain the below.

- i) Conjunction
- ii) Quadrature

(08 marks)

3) a) List down three common chart projections.

(06 marks)

b) Describe the use of Gnomonic Charts for plotting a great circle track between two points and the procedure of transferring the great circle track to a Mercator Chart.

(08 marks)

c) List the advantages of the Mercator Charts.

4) a) What is meant by the Equation of Time?

(05 marks)

b) "Equation of Time is considered as composed of two components". Clearly explain the above statement.

(10 marks)

c) Find the equation of time at 1500Hrs GMT, when the GHA of the Sun was $42^{\circ} 04.7'$.

(05 marks)

5) It is required to apply set of corrections to sextant altitude to obtain the true altitude of a celestial body.

Your answer should contain clear explanations of below with suitable diagrams.

- a) Index Error
- b) Dip
- c) Refraction
- d) Semi-diameter
- e) Horizontal Parallax

(20 marks)

6) a) Sketch and describe the arcs of great circles of PZX Spherical triangle.

(08 marks)

b) Describe what is Magnitude of a celestial body and how do you find the magnitude of celestial bodies.

(06 marks)

c) Explain why the planet Venus appears as a Morning and Evening Star.

(06 marks)



**DIRECTORATE OF MERCHANT SHIPPING
GOVERNMENT OF SRI LANKA**

CERTIFICATE OF COMPETENCY EXAMINATION

GRADE : OFFICER IN CHARGE OF A NAVIGATIONAL WATCH ON SHIPS OF
500 GT OR MORE (UNLIMITED)

SUBJECT : OPERATIONAL SAFETY

DATE : 25.10.2023

Time allowed THREE hours

Total marks : 170

Answer all questions

Pass marks : 60%

Formulae and all intermediate steps taken in reaching your answer should be clearly shown. You may draw sketches wherever required.

1. Knowledge in cargo refrigeration plant is an essential requirement for deck officers on Refer vessels. Answer following questions in relation to cargo refrigeration.
 - a. Explain in detail with suitable diagram the principle of cargo refrigeration plant. (10Marks)
 - b. Explain in detail reasons for temperature control on refer vessels. (10 Marks)
 - c. Describe hold preparation on a refrigerated cargo vessel prior loading of refrigerated cargo. (10 Marks)
2. Explain following cargo related definitions.
 - a. Cargo sweet
 - b. Grain capacity
 - c. Safe Working Load (SWL)
 - d. Flash Point
 - e. Dynamic separation(4 marks each)
3.
 - a) According to the loading plan it is required to shift the shore loader form hold number 4 to hold number 2 when the hold number 4 is loaded 4000MT of wheat. Dimensions of the hold are L-26m x B-26m x D-22m and stowage factor of wheat is 1.45m³/T. As duty officer at what height you will stop the loading in hold number 4 and shift to hold number 2 considering cargo surface remain flat during loading operation. (15 marks)

- b) Before cargo operation it is customary requirement to check all cargo gear prior handing over cargo gear to stevedores. Briefly describe pre-operation checks to be carried out for lifting gear as a duty officer on a general cargo ship.

(15 Marks)

4.

- a) With reference to the IMDG code, describe the precautions that you should take as an OOW before loading any DG packages on board your vessel.

(10 marks)

- b) With reference to Solid bulk cargo handling, describe the information that the Master and /Shipper or Terminal should exchange as per the BLU code.

(10 marks)

- c) With reference to carriage of Solid bulk cargo, describe the precautions that you should take while loading/carrying Group A, B and C cargo in bulk.

(10 marks)

5.

- a) With regard to dry docking, what documentation and plans are most likely to be readily available?

(07 marks)

- b) State the preparations and precautions you would adopt for entry in to a dry dock

(10 marks)

- c) Explain in brief what is the docking plan?

(06 marks)

- d) List the standard items to be checked at the dry docking

(07 marks)

6. Answer the following questions with regard to MARPOL Annex 1:

- a) What are the precautions and guidelines that you should follow when pumping out engine room oil bilges of a cargo vessel?

(15 marks)

- b) What are the precautions and guidelines that you should follow when pumping out cargo pump room bilges on board a tanker?

(15 marks)

Library
Ministry

00030



**DIRECTORATE OF MERCHANT SHIPPING
GOVERNMENT OF SRI LANKA**

CERTIFICATE OF COMPETENCY EXAMINATION



GRADE : OFFICER IN CHARGE OF A NAVIGATIONAL WATCH ON SHIPS OF
500 GT OR MORE (UNLIMITED)
SUBJECT : PRINCIPLES OF NAVIGATION
DATE : 17.08.2023

Time allowed THREE hours Total marks : 180
Answer all questions Pass marks : 60%
Formulae and all intermediate steps taken in reaching your answer should be clearly shown.
You may draw sketches wherever required.

1) With the aid of diagrams explain the following;

a) i) GHA ii) SHA iii) Declination iv) Geographical Position (16 marks)

b) With the aid of diagrams derive the followings;

- i) $LHA^* = GHA\gamma + SHA^* + Long (E)$
 - ii) $LHA^* = GHA\gamma + SHA^* - Long (W)$
- (04 marks)

2) a) Describe with the aid of a diagram the phases of the Moon. (08marks)

b) Why does the duration of the Moon's Synodic Period is longer than Sidereal Period (04 marks)

c) With the aid of a sketch describe 3 types of Lunar Eclipses. (08 marks)

3) a) Explain how to find equation of time from Nautical Almanac with a suitable example. (06 marks)

b) Find the equation of time at 1400hrs GMT, when the GHA of the Sun was $31^{\circ} 00'$. (08 marks)

c) Describe the following;

- i) Sidereal Year
- ii) Tropical Year (06 marks)

- 4) a) Explain the Kepler's three laws of planetary motion (10 marks)
- b) What are the approximate perihelion and aphelion distances and dates of the earth? (05 marks)
- c) With the aid of a diagram explain the Apparent Motion of planet "Jupiter". (05 marks)
- 5) a) Describe the following;
i) Civil Twilight
ii) Nautical Twilight
iii) Astronomical Twilight (09 marks)
- b) What condition must be satisfied for Twilight to last all night? (06 marks)
- c) Explain the reason why Twilight last longer in higher latitudes. (05 marks)
-
- 6) a) Describe the following with suitable diagrams.
i) Elongation
ii) Conjunction
iii) Opposition
iv) Quadrature (14 marks)
- b) Calculate the LHA of a star whose RA is 74° , for an observer in longitude 40°E , when GHA γ is 205° . (06 marks)



**DIRECTORATE OF MERCHANT SHIPPING
GOVERNMENT OF SRI LANKA**

CERTIFICATE OF COMPETENCY EXAMINATION



GRADE : OFFICER IN CHARGE OF A NAVIGATIONAL WATCH ON SHIPS OF
500 GT OR MORE (UNLIMITED)

SUBJECT : OPERATIONAL SAFETY

DATE : 06th March 2023

Time allowed THREE hours

Total marks : 180

Answer all questions

Pass marks : 60%

Formulae and all intermediate steps taken in reaching your answer should be clearly shown. You may draw sketches wherever required.

1) Briefly describe following:

- a. Gross tonnage
- b. Lower Flammable limit
- c. Breaking Stress
- d. Grain capacity
- e. Auto ignition temperature
- f. Proof load

(5 Marks each)

2) Answer following question in relation to cargo operation and cargo care :

- a) Seaworthiness of a vessel depends on several factors and lashing and securing of cargoes are one of the integral part of the seaworthiness. Failure of proper lashing and securing of cargoes leads to disasters situations at sea. Explain actions and measures to be taken if a vessel experienced a cargo shift during the course of the voyage.

(10Marks)

- b) Cargo contamination damages are one of the common issue on merchant vessels . Explain in brief situations may leads to cargo contamination.

(10 marks)

- c) Describe what are the checks to be carried out after loading on a Bulk cargo vessel.

(10 Marks)

3)

- a) Explain in detail how you perform a safe cargo watch as a duty officer on a "General Cargo vessel".

(15 Marks)

- b) Estimate the cargo loadable quantity on a vessel is having 5 identical cargo holds of L-32x B-34x D-22 is to load wheat in bulk SF 1.32cbm/t. her summer dead weight is 48265mt and weight onboard at the loading port are FO – 1020mt, DO – 164mt, FW – 178mt, constant – 450mt. Find maximum amount of wheat that she can load without overloading.

(15 marks)

4)

- a) As a duty officer to supervise container loading and discharging, describe with illustrations how you are going to identify the positions of containers on a container vessel.

(10 Marks)

- a) Describe in detail the precautions that you would take as duty officer while loading and discharging of containers.

(10 marks)

- b) List the advantages and disadvantages of container trade compared to old conventional general cargo carriage.

(10 Marks)

5) The IMDG code has been created as per the recommendations of the United Nations, panel of expert on transport of dangerous goods along with the IMO (International Maritime Organization).

- (a) Explain the principal of the IMDG code?

(10 Marks)

- (b) States the safety precautions to be taken while dealing dangerous cargo?

(5Marks)

- (c) Define the limited quantity and excepted quantity?

(10 Marks)

- (d) What is Marine Pollutant declaration and sketch the symbol of the Pollutant?

(5 Marks)

6)

- a) During tanker operations Inert gas plays a major role. Explain this statement using suitable diagrams.

(20 marks)

- b) Explain what precaution you take as OOW to prevent building up of Static electricity during tanker operations.

(10 marks)



**DIRECTORATE OF MERCHANT SHIPPING
GOVERNMENT OF SRI LANKA**

CERTIFICATE OF COMPETENCY EXAMINATION

GRADE : OFFICER IN CHARGE OF A NAVIGATIONAL WATCH ON SHIPS OF
500 GT OR MORE (UNLIMITED)

SUBJECT : OPERATIONAL SAFETY

DATE : 06th March 2023

Time allowed THREE hours

Total marks : 180

Answer all questions

Pass marks : 60%

Formulae and all intermediate steps taken in reaching your answer should be clearly shown. You may draw sketches wherever required.

1) Briefly describe following:

- a. Gross tonnage
- b. Lower Flammable limit
- c. Breaking Stress
- d. Grain capacity
- e. Auto ignition temperature
- f. Proof load

(5 Marks each)

2) Answer following question in relation to cargo operation and cargo care :

- a) Seaworthiness of a vessel depends on several factors and lashing and securing of cargoes are one of the integral part of the seaworthiness. Failure of proper lashing and securing of cargoes leads to disasters situations at sea. Explain actions and measures to be taken if a vessel experienced a cargo shift during the course of the voyage.

(10Marks)

- b) Cargo contamination damages are one of the common issue on merchant vessels . Explain in brief situations may leads to cargo contamination.

(10 marks)

- c) Describe what are the checks to be carried out after loading on a Bulk cargo vessel.

(10 Marks)

3)

- a) Explain in detail how you perform a safe cargo watch as a duty officer on a "General Cargo vessel".

(15 Marks)

- b) Estimate the cargo loadable quantity on a vessel is having 5 identical cargo holds of L-32x B-34x D-22 is to load wheat in bulk SF 1.32cbm/t. her summer dead weight is 48265mt and weight onboard at the loading port are FO – 1020mt, DO – 164mt, FW – 178mt, constant – 450mt. Find maximum amount of wheat that she can load without overloading.

(15 marks)

4)

- a) As a duty officer to supervise container loading and discharging, describe with illustrations how you are going to identify the positions of containers on a container vessel.

(10 Marks)

- a) Describe in detail the precautions that you would take as duty officer while loading and discharging of containers.

(10 marks)

- b) List the advantages and disadvantages of container trade compared to old conventional general cargo carriage.

(10 Marks)

5) The IMDG code has been created as per the recommendations of the United Nations, panel of expert on transport of dangerous goods along with the IMO (International Maritime Organization).

- (a) Explain the principal of the IMDG code?

(10 Marks)

- (b) States the safety precautions to be taken while dealing dangerous cargo?

(5Marks)

- (c) Define the limited quantity and excepted quantity?

(10 Marks)

- (d) What is Marine Pollutant declaration and sketch the symbol of the Pollutant?

(5 Marks)

6)

- a) During tanker operations Inert gas plays a major role. Explain this statement using suitable diagrams.

(20 marks)

- b) Explain what precaution you take as OOW to prevent building up of Static electricity during tanker operations.

(10 marks)

Four library

00002



MERCHANT SHIPPING SECRETARIAT
GOVERNMENT OF SRI LANKA
CERTIFICATE OF COMPETENCY EXAMINATION



GRADE : OFFICER IN CHARGE OF A NAVIGATIONAL WATCH ON SHIPS OF 500 GT OR MORE (UNLIMITED)

SUBJECT : COASTAL NAVIGATION

DATE : 07th March 2023

Time : 0900 to 1200 hrs

Time allowed **THREE hours**

Total marks : 100

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.

Data and Information:

- BA Chart 5049
- Tide Graph
- Parallel Ruler
- Divider
- Deviation Card

1 Vessel to plan her next passage from Port of Le Havre, France to Port of Brixham, England via Casquets TSS. Vessel maximum draught 11.8 m, length overall (LOA) 199 m & her engine speed 16 knots. She is fitted and operational with all mandatory equipment for her size.

a) List down name of 08 number of Nautical Publications to be used for above 'Passage Planning'

(04 marks)

b) Propose a route on BA chart 5049 (English Channel) from Le Havre Pilot Boarding Ground (PBG) to Brixham Deep-Sea Pilots (near Berry Hd Light) via off Casquets Traffic Separation Scheme (TSS) complies with Rule 10 of COLREG & observing the relevant notes of BA 5049. Required information and warnings shall be marked on the chart.

(12 marks)

c) Prepare the 'Course Card' in below format,
WP – Position – Course – Distance – Distance To Go – Remarks

(04 marks)

- 2 a) Briefly explain with the aid of diagram,
- i) Chart Datum (CD/LAT) (02 marks)
 - ii) Spring range of tide (02 marks)
 - iii) Height of tide (02 marks)

- b) A vessel at Bulk Terminal in Vancouver (Canada) expects to complete her cargo operations at early morning on 27th of December. Her expected sailing draught is 14.0 m and she requires to have an under keel clearance of minimum of 1.0 m. Calculate the latest time that the vessel can sail out on same day during rising tide where she has to cross a shallow patch with charted depth of 11.4 m.
Extract from the TT is as follows.

27 th December	
02 09	0.4 m
09 38	5.1 m
15 38	3.1 m
19 51	4.3 m

(09 marks)

- 3 a) i) Find the raising distance of C' de Antifer Lt (Fl. 27M) if the height of eye is 10m (33 feet). (05 marks)
- b) At 0430 hrs Nab tower light dipped bearing 345° (T). From this position course was set by compass to pass Les Hanois light house 14.0 miles off when abeam to port.
- i) Find the course to steer. (04 marks)
 - ii) While in the above course it was decided not to get close than 8 miles off Casquets lighthouse (height of Casquets lighthouse 40m). Calculate the vertical danger angle to set on the sextant and the ETA when Less Hanois lighthouse will be abeam. (HE-12.9m, IE-3' on the arc, speed-13 kts) (06 marks)

- 4 a) At 0800 hrs vessel observed Horizontal Sextant Angle of 50° between Nab Tower Light House & St' Catherine Light House. And same time Nab Tower Light House bore $327^{\circ}(T)$, Fix the vessel's position at 0800 hrs. **(08 marks)**
- b) At 0800 hrs vessel course was altered to such heading and on that course Anvil Point Light House bore 4 point on STBD bow. After 12 NM distance steamed from there same light house abeam on same course at 1100 hrs. Assuming that there is no wind & current,
- i) Find the vessel's Course & beam bearing to Anvil Point Light House. **(03 marks)**
- ii) When Anvil Point Light House bore 4 point on STBD bow, fix the vessel's position & find the bearing. **(03 marks)**
- iii) Calculate her Engine Speed. **(02 marks)**
- c) In above passage vessel compass heading was $264^{\circ}(C)$, find her Deviation for that heading, taking Variation as per Compass Rose at Dover Strait. **(04 marks)**
- 5 a) On 10th January, noon position was found with Les Hanois Lt Ho bearing $070^{\circ}(T)$, Distance 8 miles. From noon position, set course by compass to make good a course of $235^{\circ}(T)$ counteracting a current setting $123^{\circ}(T)$ at 4 knots and leeway of 3° . (Wind NNW force 5) **(07 marks)**
- b) Also calculate the time and distance off Les Sept. Iles Lt when abeam. (Speed 13.5 knots, Variation as per the chart. Deviation as per the card provided) **(08 marks)**
- 6 a) Briefly explain the application of Blind Pilotage. **(05 marks)**
- b) Briefly explain the risk involved with Blind Pilotage. **(05 marks)**
- c) State 05 points to be considered for Blind Pilotage Planning. **(05 marks)**
(

Deviation Card			
Ship's head by compass	Deviation	Ship's head by compass	Deviation
000°	2.0° W	180°	2.0° E
010°	3.5° W	190°	3.5° E
020°	5.5° W	200°	5.0° E
030°	7.0° W	210°	7.0° E
040°	9.0° W	220°	8.5° E
050°	10.0° W	230°	10.0° E
060°	11.5° W	240°	11.0° E
070°	12.0° W	250°	12.0° E
080°	12.5° W	260°	13.0° E
090°	12.5° W	270°	12.5° E
100°	11.5° W	280°	11.5° E
110°	10.5° W	290°	10.0° E
120°	9.0° W	300°	8.0° E
130°	7.0° W	310°	6.5° E
140°	5.0° W	320°	4.5° E
150°	3.0° W	330°	2.5° E
160°	1.0° W	340°	1.0° E
170°	0.5° E	350°	0.5° W
180°	2.0° E	360°	2.0° W



CINEC CAMPUS (PVT) LTD.
Faculty of Maritime Sciences
Department of Navigation

CERTIFICATE OF COMPETENCY EXAMINATION
OFFICER IN CHARGE OF A NAVIGATIONAL WATCH ON SHIPS OF 500 GT OR MORE (UNLIMITED)
COASTAL NAVIGATION

- Answer all questions
- Total Marks: 180

Date: 01.11.2022

Pass mark: 70%

Time allocated: 03 Hours

1) State the meaning of the following Admiralty Chart Abbreviations/symbols as illustrated in BA 5011:

Question number	Symbol
a)	[93] (19-40)
b)	
c)	
d)	
e)	S G Sh

(04 marks each)

2) Answer the following questions with regard to **bridge watch keeping as a duty officer:**

- List the factors that need to consider when deciding the watch level at sea. (05 marks)
- List the factors that need to consider while taking over the watch (10 marks)
- State the occasions that a OOW may call the master (10 marks)

3) Answer the following questions:

- a) With the aid of diagrams explain how the spring and neap tides occur. (08 marks)
- b) A vessel is expecting to enter port of Dover with a draught of 15 m on 20th of November. The master wants to keep an UKC of one metre throughout. Calculate the earliest time she can enter the port of Dover, if the charted depth is 11 m. (12 marks)

4) Answer the following questions with reference to the Data sheet – 1.

- a) It shows four tracks, state, with reasons, the tracks that comply and the tracks that do not comply with Rule 10 of International Collision Regulations. (16 marks)
- b) Identify the symbols 1, 2, 3, 4, 5, 6 and 7 in accordance with the BA 5011. (14 marks)

5) a) At 2245 hrs a vessel observed Awa Saki Pt. Lt. ($35^{\circ} 07.7' N$, $139^{\circ} 37.8' E$) bearing $000^{\circ} (T) \times 2.0'$. She is expecting to proceed to Tokyo after taking Tokyo Bay Pilot. Her engine speed is 16 knts and the draught is 18 m. Plan a passage to Tokyo (arrival position at Tokyo – $35^{\circ} 30.5' N$, $139^{\circ} 50' E$) from the position at 2245 hrs assuming that the vessel is equipped with the required equipment for her size. (50 marks)

b) Give your text of the first report to “Tokyo Wan Traffic Advisory Service Centre”. (05 marks)

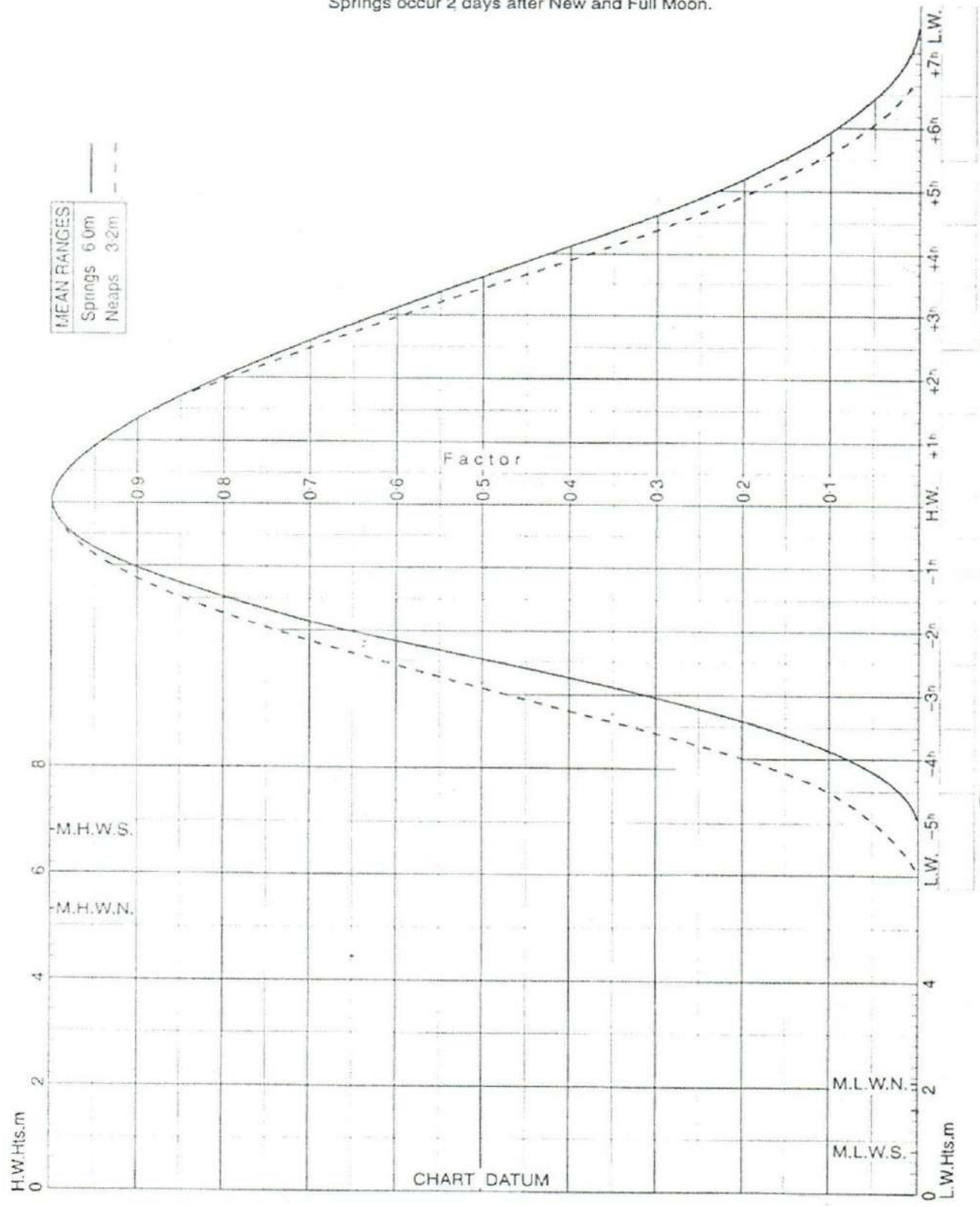
c) Calculate the ETA at arrival position at Tokyo. (05 marks)

d) Calculate the course to steer between buoy No. 2 ($35^{\circ} 12.7' N$, $139^{\circ} 47.2' E$) and buoy No. 4 ($35^{\circ} 15.4' N$, $139^{\circ} 47.2' E$) if the vessel is experiencing a current with a set of $050^{\circ} (T)$ and a rate of 3 knots. (15 marks)

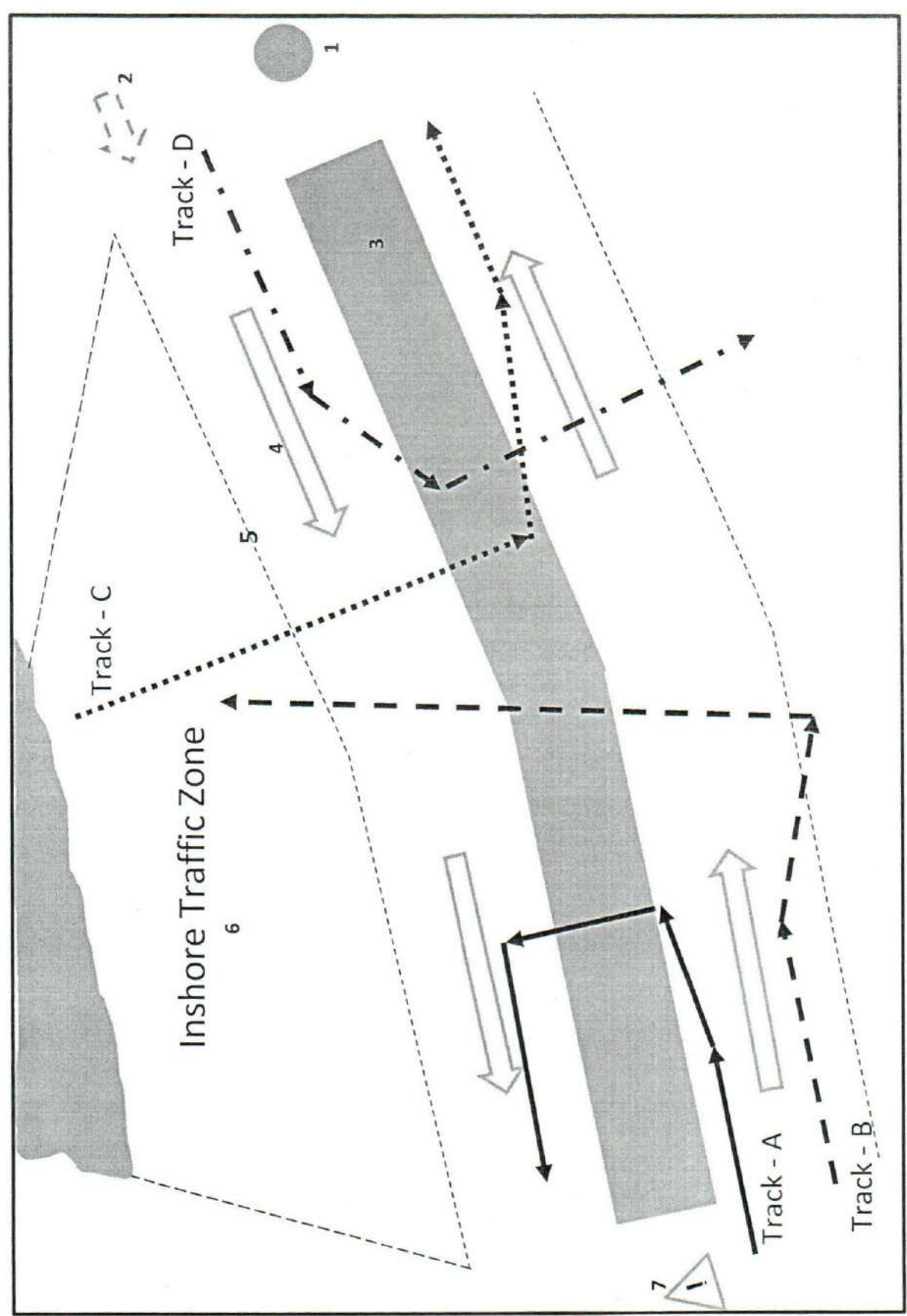
e) Just after passing the above buoy No. 2, the vessel encounters a steering gear failure and a main engine failure. What are the actions to be taken as a duty officer? (05 marks)

f) On arrival at the arrival position at Tokyo, master drop the port anchor 6 shackles on deck while the heading was $060^{\circ} (T)$. If the vessel's length is 232 m, draw the vessel's swinging circle. (05 marks)

DOVER
 MEAN SPRING AND NEAP CURVES
 Springs occur 2 days after New and Full Moon.



Data sheet - I





CINEC CAMPUS (PVT) LTD.
Faculty of Maritime Sciences
Department of Navigation

CERTIFICATE OF COMPETENCY EXAMINATION

OFFICER IN CHARGE OF A NAVIGATIONAL WATCH ON SHIPS OF 500 GT OR MORE (UNLIMITED)

OCEAN AND OFFSHORE NAVIGATION



- Answer all questions.
- Formulae & all intermediate steps taken in reaching your answer should be clearly shown.
- Total Marks: 200

Date: 03.11.2022

Pass mark 70%

Time allocated: 03 Hours

1. A vessel in position $40^{\circ} 50'N$, $050^{\circ} 00'W$ has to proceed to position $43^{\circ} 00'N$, $015^{\circ} 00'W$ by a great circle track. Find the following;
 - a) Great Circle distance
 - b) Initial course
 - c) Final course

(40 marks)

2. Find by Mercator's Principle the course and distance from starting position $14^{\circ} 00'S$, $172^{\circ} 00'W$ to $17^{\circ} 30'N$, $149^{\circ} 30'W$.

(25 marks)

3. On 22nd September 1992, PM ship in DR $40^{\circ} 36'S$ $140^{\circ} 48'W$, the sextant altitude of Saturn was $54^{\circ} 56.2'$ at 04h 14m 36s chronometer time (error 06m 30s fast). If IE was $3.0'$ on the arc and HE was 20m, find,
 - a) The longitude where it crosses the DR lat.
 - b) The direction of the Position Line (PL)
 - c) The position through which to draw the PL

(35 marks)

4. On 22nd September 1992, AM at ship in DR $10^{\circ} 02'S$, $076^{\circ} 50'E$, the sextant altitude of the Moon's LL was $44^{\circ} 31.7'$ when the chronometer showed 00h 17m 21s (error 07m 28s slow). If IE was $0.6'$ on the arc and HE was 14m, find by intercept method the direction of the PL and a position through which to draw it.

(35 marks)

5. On 1st Dec 1992, AM at ship in DR $47^{\circ} 24'N$ $143^{\circ} 18'E$, the sextant altitude of the Polestar was $46^{\circ} 50.4'$ at 08h 50m 10s chronometer time (error 05m 52s slow). If IE was $2.0'$ off the arc and HE was 16m, find the direction of the Position Line (PL) and a position through which it passes.

(25 marks)

6. a) On 12th Sept 1992, in DR $43^{\circ} 12' S$ $072^{\circ} 18' E$, the sextant meridian altitude of the star ALDEBARAN was $30^{\circ} 28.4'$. If IE was $1.2'$ off the arc and HE was $17m$, find the latitude and direction of the PL.

(20 marks)

- b) On 1st May 1992, in DR $30^{\circ} 12' N$, $179^{\circ} 36' W$, the Sun set bore 287° (C). If variation was $3^{\circ} W$, find the deviation of the compass.

(20 marks)



CINEC CAMPUS (PVT) LTD.
Faculty of Maritime Sciences
Department of Navigation

CERTIFICATE OF COMPETENCY EXAMINATION
OFFICER IN CHARGE OF A NAVIGATIONAL WATCH ON SHIPS OF 500 GT OR MORE (UNLIMITED)
OPERATIONAL SAFETY

- Answer all questions
- Total Marks: 180

Date: 02.11.2022

Pass mark: 60%

Time allocated: 03 Hours

1) Explain following definitions:

- Measurement cargoes
- Cargo sweet
- Ship sweet
- Load density
- Lower Flammable Limit
- Rigged to disadvantage

(5 Marks)

each)

2) Answer the following question in relation to the cargo operation and cargo care:

- Temperature regulated cargoes are more susceptible for variations in temperatures in the stowage atmosphere. Explain in detail with a suitable diagram the principal of cargo refrigeration plant.

(10 marks)

- Ventilation is a process of exchanging or replacing air in a compartment according to desired requirements. Briefly explain purpose of ventilation onboard a cargo vessel.

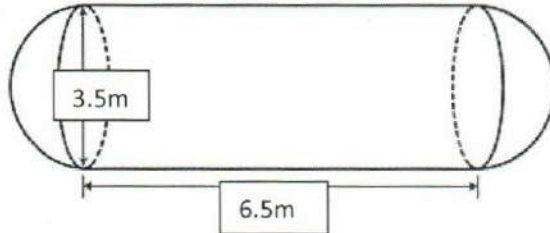
(10 marks)

- Carriage of cargoes on merchant vessels are associate with many hazards. In relation to deck cargoes briefly explain hazards associate with deck cargoes.

(10 marks)

3)

- a) A tank with following dimensions has to load with oil of RD 0.91. find the mass of oil that can be loaded allowing 8% of the volume of oil for expansion. (Use following formula to find the volume of sphere – $(4 \times \pi \times r^3)/3$)



(10 marks)

- b) Briefly describe
- Oil Record Book
 - Garbage Management Plan

(5 Marks)

each)

- c) Globally many countries are having their own local ballast water regulations and requirements. Compliance of vessels calling to these ports being checked by sampling and records maintained in relation to ballast operations. Briefly explain what documents the vessel should have onboard in relation to Ballast Water Management.

(10 Marks)

4)

- a) How do you grade the marine pollutants and explain the ways and means of identifying same once a package is placed on board?
- b) What do you understand by the following columns in the dangerous good list?
- Subsidiary Risk
 - Emergency Schedules

(10 marks)

(12 marks)

- c) The treatment of casualties should be done symptomatically. What does this statement mean to you and what difference does it make compared with the previous practice?

(08 marks)

- 5)
- a) Crude oil tankers are fitted with Inert Gas system which minimize the explosion hazards while transporting the crude oil. Briefly describe benefits of Inert Gas system.
(10 Marks)
 - b) Inert Gas system provides certain advantage and disadvantages briefly explain advantages and disadvantages of the Inert Gas system.
(20 Marks)
- 6) With reference to IMSBC code,
- a) Explain the following.
 - i) Angle of Repose
 - ii) Transportable Moisture Limit
 - iii) Flow moisture point
 - iv) Moisture migration
(5 Marks each)
 - b) What are the information that you seek from the shipper before accepting a shipment under this code?
(10 Marks)



CINEC CAMPUS (PVT) LTD.
 Faculty of Maritime Sciences
 Department of Navigation

CERTIFICATE OF COMPETENCY EXAMINATION
 OFFICER IN CHARGE OF A NAVIGATIONAL WATCH ON SHIPS OF 500 GT OR MORE (UNLIMITED)
PRINCIPLES OF NAVIGATION

- Answer any six (06) questions.
- Formulae & all intermediate steps taken in reaching your answer should be clearly shown.
- Total marks: 120

Date: 04.11.2022

Pass mark: 70%

Time allocated: 03 Hours

1. With the aid of diagrams explain the following;

- a) i) GHA ii) SHA iii) Declination iv) Geographical Position (08 marks)
- b) With the aid of diagrams derive the followings;
 i) $LHA^* = GHA\gamma + SHA^* + Long (E)$
 ii) $LHA^* = GHA\gamma + SHA^* - Long (W)$ (06 marks)
- c) Calculate the LHA of a star whose RA is 74° , for an observer in longitude $40^\circ E$, when $GHA\gamma$ is 205° . (06 marks)

2. a) Why does the duration of the Moon's Synodic Period is longer than Sidereal Period (06 marks)

b) With the aid of a sketch describe Lunar Eclipse. (06 marks)

c) Describe with a diagram the phases of the Moon. (08 marks)

3. a) Explain how to find equation of time from Nautical Almanac with a suitable example. (06 marks)

b) Find the equation of time at 1400 hrs GMT, when the GHA of the Sun was $31^\circ 00'$. (08 marks)

c) Describe the following;

- i) Sidereal Year ii) Tropical Year (06 marks)

4. a) Explain the Kepler's three laws of planetary motion (10 marks)
- b) Describe the difference of Inferior and Superior Conjunctions (05 marks)
- c) With the aid of a diagram explain the Apparent Motion of planet "Jupiter". (05 marks)
5. a) Describe the following;
- i) Civil Twilight
 - ii) Nautical Twilight
 - iii) Astronomical Twilight
- (09 marks)
- b) What condition must be satisfied for Twilight to last all night? (06 marks)
- c) Explain the reason why Twilight last longer in higher latitudes. (05 marks)
6. a) Describe the following with suitable diagrams.
- i) Elongation
 - ii) Conjunction
 - iii) Opposition
 - iv) Quadrature
- (12 marks)
- b) Sketch and describe the arcs of great circles of PZX Spherical triangle. (08 marks)
7. a) Explain the following;
- i. Parallel Sailing
 - ii. Departure between two positions
- (10 marks)
- b) What is the Parallel Sailing Formula? (04 marks)
- c) Derive the Parallel Sailing Formula. (06 marks)



**DIRECTORATE OF MERCHANT SHIPPING
GOVERNMENT OF SRI LANKA**

CERTIFICATE OF COMPETENCY EXAMINATION

GRADE : OFFICER IN CHARGE OF A NAVIGATIONAL WATCH ON SHIPS OF
500 GT OR MORE (UNLIMITED)

SUBJECT : PRINCIPLES OF NAVIGATION

DATE : 17.08.2023

Time allowed THREE hours

Total marks : 180

Answer all questions

Pass marks : 60%

Formulae and all intermediate steps taken in reaching your answer should be clearly shown.
You may draw sketches wherever required.

1) With the aid of diagrams explain the following;

a) i) GHA ii) SHA iii) Declination iv) Geographical Position

(16 marks)

b) With the aid of diagrams derive the followings;

i) $LHA^* = GHA\gamma + SHA^* + Long (E)$

ii) $LHA^* = GHA\gamma + SHA^* - Long (W)$

(04 marks)

2) a) Describe with the aid of a diagram the phases of the Moon.

(08marks)

b) Why does the duration of the Moon's Synodic Period is longer than Sidereal Period

(04 marks)

c) With the aid of a sketch describe 3 types of Lunar Eclipses.

(08 marks)

3) a) Explain how to find equation of time from Nautical Almanac with a suitable example.

(06 marks)

b) Find the equation of time at 1400hrs GMT, when the GHA of the Sun was $31^{\circ} 00'$.

(08 marks)

c) Describe the following;

i) Sidereal Year

ii) Tropical Year (06 marks)

- 4) a) Explain the Kepler's three laws of planetary motion (10 marks)
- b) What are the approximate perihelion and aphelion distances and dates of the earth? (05 marks)
- c) With the aid of a diagram explain the Apparent Motion of planet "Jupiter". (05 marks)
- 5) a) Describe the following;
i) Civil Twilight
ii) Nautical Twilight
iii) Astronomical Twilight (09 marks)
- b) What condition must be satisfied for Twilight to last all night? (06 marks)
- c) Explain the reason why Twilight last longer in higher latitudes. (05 marks)
- 6) a) Describe the following with suitable diagrams.
i) Elongation
ii) Conjunction
iii) Opposition
iv) Quadrature (14 marks)
- b) Calculate the LHA of a star whose RA is 74° , for an observer in longitude 40°E , when GHA γ is 205° . (06 marks)