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CHAPTER 11 - MASTER, INTERMEDIATE VOYAGE, AND MASTER, LOCAL VOYAGE

PART I - GENERAL REQUIREMENTS OF APPLICANTS

11.1 (1) Every applicant for a certificate as Master, Intermediate Voyage, or Master, Local Voyage, shall

(a) **either**

(i) obtain:

(A) a certificate of completion for the three-year course set out in TP 5562 from a school listed in TP 10655; and

(B) a minimum of 18 months service when approval for graduation is granted to First Mate, Intermediate Voyage, as officer in charge of the watch as follows:

(aa) a minimum of 12 months service after obtaining a certificate as First Mate, Intermediate Voyage, as officer in charge of the watch on ships of least 200 tons gross tonnage making foreign voyages or voyages including a deep-sea passage, and

(bb) the remaining service made up of service after obtaining a certificate as Watchkeeping Mate, Ship, as officer in charge of the watch on ships of at least 25 tons gross tonnage making voyages extending beyond partially smooth water limits;

or

(ii) complete 24 months service as follows:

(A) a minimum of 12 months sea service after obtaining a certificate as First Mate, Intermediate Voyage, as officer in charge of the watch on ships of at least 200 tons gross tonnage on foreign voyages or on voyages including a deep-sea passage where an applicant applies for a certificate as Master, Intermediate Voyage;

(B) a minimum of 12 months sea service after obtaining a certificate as First Mate, Intermediate Voyage, or First Mate, Local Voyage, as officer in charge of the watch on ships of at least 200 tons gross tonnage on voyages extending beyond partially smooth water limit where an applicant applies for a certificate as Master, Local Voyage; and

(C) the remaining service made up after obtaining a certificate as Restricted Watchkeeping Mate, Ship, or Watchkeeping Mate, Ship, on ships of not less than 25 tons gross tonnage making voyages extending beyond partially smooth water limits;


(b) obtain a medical certificate prescribed by the Crewing Regulations;

(c) obtain a certificate of completion for each of the following courses from a school or organization listed in TP 10655:

(i) Marine Emergency Duties Course, Senior Officer (D) set out in TP 4957;

(ii) Simulated Electronic Navigation Course Level II, set out in TP 4958; and

(iii) Marine First Aid Advanced Course, set out in TP 13008;

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- (d) pass an examinations in each of the following subjects:
- (i) Navigation Safety;
 - (ii) Ship Management; and
 - (iii) Cargo;
- (e) pass a practical examination in Simulated Electronic Navigation Level II; and
- (f) pass an oral examination in General Seamanship.
- (2) Every applicant for a certificate as Master, Intermediate Voyage, shall
- (a) complete the requirements of paragraphs (1) (a) to (f); and
 - (b) pass an examination in each of the following subjects:
 - (i) Astro and Electronic Navigation;
 - (iii) Ship Construction and Engineering Knowledge; and
 - (iii) Meteorology.
- (3) Every applicant for a certificate as Master, Local Voyage, shall
- (a) complete the requirements of paragraphs (1) (a) to (f); and
 - (b) pass an examination in each of the following subjects:
 - (i) Ship Construction and Engineering Knowledge; and
 - (ii) Meteorology.
- (4) The holder of a certificate as Master, Home-Trade, or as First Mate, Foreign-Going, may be accepted for any examination for a Master, Intermediate Voyage, or Master, Local Voyage, certificate without further proof of service. The lawful holder of a certificate as Master, Inland Waters, may be accepted for any examination for a Master, Local Voyage, certificate without further proof of service.
- (5) Service with a First Mate, Home-Trade, or Second Mate, Foreign-Going, certificate will be accepted in lieu of service with a First Mate, Intermediate Voyage, certificate. Service with a First Mate, Inland Waters, certificate will be accepted in lieu of service with a First Mate, Local Voyage, certificate. In no case will less than 24 months of watchkeeping service while holding a certificate be accepted except in the case of graduates of an approved co-operative training scheme to First Mate, Intermediate Voyage, when not less than 18 months of watchkeeping service while holding a certificate will be accepted.
- (6) Service while holding a Master, Home-Trade, 350 Tons, or Master, Inland Waters, 350 Tons, certificate will be accepted in lieu of service with a First Mate, Intermediate Voyage, or First Mate, Local Voyage, certificate for a Master, Intermediate Voyage, or Master, Local Voyage, certificate, respectively. In all other respects, the service must meet the requirements of subsection (5), and the applicant must hold or be eligible to receive a First Mate, Intermediate Voyage, or First Mate, Local Voyage, certificate as appropriate.

11.2 (1) Not in use.

(2) Not in use.

PART II - EXAMINATIONS

11.3 The following table lists the examinations for Master, Intermediate Voyage, and Master, Local Voyage, certificates, the watchkeeping service required before each may be attempted, and other requirements.

A. Required for both Master, Intermediate Voyage, and Master, Local Voyage, certificates.

Examination	Qualifying Watchkeeping Service While Holding First Mate, Intermediate Voyage, or First Mate, Local Voyage, Certificate	Other Requirements
SIM 2 Chartwork and Pilotage	NIL	Must have passed SIM 1
062 Navigation Safety	12 months	Unless otherwise approved, this exam shall be taken during the same week and in the same examination centre as 163.
092 Ship Management	Nil	WKMSR or WKMS certificate
123 Cargo	Nil	WKMSR or WKMS certificate
163 General Seamanship	12 months	All other exams must have been passed before attempting 163.

B. Additional examinations for Master, Intermediate Voyage, only.

Examination	Qualifying Watchkeeping Service While Holding First Mate, Intermediate Voyage, Certificate	Other Requirements
052 Astro & Electronic Navigation	Nil	WKMS Certificate
073 Meteorology	Nil	WKMS Certificate
133 Ship Construction and Engineering Knowledge	Nil	WKMSR or WKMS Certificate

C. Additional Examinations for Master, Local Voyage, only

Examination	Qualifying Watchkeeping Service While Holding First Mate, Intermediate Voyage, or First Mate, Local Voyage, Certificate	Other Requirements
073 Meteorology	Nil	WKMSR or WKMS Certificate
132 Ship Construction and Engineering Knowledge	Nil	WKMSR or WKMS Certificate

11.4 Certificate as First Mate, Foreign-Going; Master, Home-Trade; and Master, Inland Waters, will be credited as passes against examinations for Master, Intermediate Voyage, and Master, Local Voyage certificates as listed in Appendix F.

PART III - VALIDITY OF CERTIFICATES

11.5 (1) The Master, Intermediate Voyage, Certificate is valid as:

- (a) first mate of a foreign-going vessel;
- (b) master of an intermediate voyage vessel;
- (c) master of a local voyage vessel; and
- (d) master of a minor waters vessel.

(2) The Master, Local Voyage, Certificate is valid as:

- (a) master of a local voyage vessel; and
- (b) master of a minor waters vessel.

PART IV - SYLLABUSES OF EXAMINATIONS

11.6 Simulated Electronic Navigation

Examination number SIM 2

Companion to Sections 14.5 and 18.5

ITEM	COLUMN
1.	The syllabus of the examination is presented in TP 4958, Simulated Electronic Navigation Courses.
2.	Preparation of Passage To be completed ahead of simulator examination.
3.	Simulator Exercise (duration two hours) Includes items 2, 3, and 4; passage about 20 nautical miles; parallel indexing, including wheel over; complex collision avoidance; course alteration for navigational purposes; all available electronic navigation.
4.	Navigator Notebook Navigator notebook to include chart number and courses for voyage, course alteration and wheel over positions, position of danger areas in the proximity of the intended track, traffic CIPs and distance to next CIP; position where a change of machinery status will be required; parallel indexing information or information on the elements used to construct an ARPA graphic map; radar datum chosen for PI; time of HW/LW and information on tidal currents; pilotage information, if applicable; total distance and steaming time at proposed speed.
5.	Manoeuvre a Ship Manoeuvring a ship, stopping, mooring, and anchoring.
6.	Emergencies Emergencies may be introduced but not at a critical moment during the exercise.

Note: The examination consists of simulated exercises conducted by Marine Safety.
Time for passage planning one and a half to three hours.
Total duration four to five hours.

11.7 Navigation Safety

Examination number 062


Companion to Section 15.10

ITEM	COLUMN
1.	Navigation Safety Practical application of rules from an interpretation in multi-ship navigational situations; Regulations for the Prevention of Collisions with Canadian Modifications; multi-ship or multi-factor navigational situations involving more than one rule, more than one factor of radar annex; Ship Routing Regulations; inconsistencies between regulations, ordinary practices of seafarer; application of STCW Code section A-VIII/2; Notice to Mariners – Annual Edition.

Note: The examination consists of a screening test and oral examination.
Duration approximately one and a half hours, as necessary.

11.8 Ship Management
Examination number 092

ITEM	COLUMN
1.	<i>Canada Shipping Act (CSA)</i> Knowledge of CSA relating to engagement and discharge of seafarers; rights of seafarers; maintenance of discipline; registration of ships; duties and powers of port wardens; wrecks; salvage and casualties; provisions; health and accommodation; distressed seafarers; fatal accidents; steamship inspectors; VTS regulations.
2.	Pilotage Knowledge of the <i>Pilotage Act</i> , including compulsory pilotage; pilot's responsibility to master; master relieving pilot; when a pilot shall not pilot; pilotage exemption or waiver; transit through major canals such as Suez and Panama, including tonnage measurements and boarding arrangements.
3.	Customs House and Immigration Knowledge of customs house and immigration procedures including: inward report; non duty paid goods; short landed or overloaded merchandise; crew declaration forms; outward report; Shipping Master's Certificate; producing certificates of competency; passports, visas and their use in foreign ports; the <i>Coasting Trade Act</i> , including coasting licenses, requirements and procedures for receiving a coasting license; revoking of coasting license; implications of change of ownership, change of flag or both; procedure on change of command.
4.	Quarantine Regulations Knowledge of the <i>Quarantine Act</i> , including purpose and application of quarantine regulations to shipping; Ship Fumigation Regulations; need for and precautions for vessel fumigation; role of Agriculture Canada; De-Rat Certificate and De-Rat Exemption Certificate.
5.	<i>Marine Liability Act</i> Knowledge of the implications of a seaworthy ship; rules relating to bills of lading, risks, responsibilities and liabilities, rights and immunities, special conditions, limitations on the application of rules, limitation of liabilities, electronic documentation and carriage contracts; Hague Rules and Cesser Clause.
6.	Tonnage Knowledge of rules for measurement of tonnage under CSA and IMO; requirement of tonnage certificate for registering a vessel; requirement for Panama and Suez tonnage measurements.
7.	Charter Parties and Bills of Lading Knowledge of types of bills of lading, contents and their functions; functions of a mate's receipt, cargo manifest/shipper's receipts; implications of electronic documentation ; the master's right to insert marginal clauses; letters of indemnity; the master's authority to sign bills of lading; Charter Clause, New Jason Clause, and <i>Jones Act</i> . Knowledge of charter parties, including interpretation of various agreements; on-hire and off-hire procedures; common-law warranties; cancelling date; notice of readiness; lay days, running days, Sundays, holidays and weather working days; demurrage and despatch; freight; deviation; disputes and claims as they relate to laytime and demurrage.
8.	Noting and Extending Protest Knowledge of the master's obligations, and circumstances when it is advisable to note and extent protest.
9.	Labour Relations Knowledge of the application of the <i>Canada Labour Code</i> to shipping; collective bargaining process; rights and limitations of access to union and non-union vessels; role of collective agreements in labour relations; ILO.
10.	Marine Insurance Basic knowledge of the marine insurance contract and its relationship to the master's responsibility to owners and underwriters; general and particular averages; policies in marine insurance; P & I clubs, their functions and responsibilities; financial responsibility certificates; limitation of liability; salvage agreements; pollution policies for tankers and non-tankers; function of classification societies; types of surveys; survey procedure related to vessel classification.


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11.	Legislation Affecting Vessel Operation Knowledge of Shipping Casualty Reporting Regulations; Shipping Inquiries Investigation Rules; Potable Water Regulations; Ship's Crew Food and Catering Regulations; Crewing Regulations; Home-Trade, Inland and Minor Water Voyage Regulations; Oil Pollution Prevention Regulations and MARPOL; <i>Arctic Waters Pollution Prevention Act</i> ; <i>Environmental Protection Act</i> ; Navigation Appliance Regulations; Charts and Publication Regulations; Load Line Regulations; Safety and Inspection Certification Regulations; <i>Merchant Seamen's Compensation Act</i> .
12.	Legislation Concerning Controlled Substances Knowledge of employee assistance program; employee rights and testing process; pre-employment testing; documentation of medical treatment and administration of controlled medication.
13.	Topics Relevant to Industry Knowledge of IMO conventions and subsequent legislation; Canadian Marine Advisory Council and its function; Standards of Training Certification and Watchkeeping and continued proficiency; SOLAS and GMDSS and related implementation; role of IMO and International Hydrographic Office (IHO); Electronic Chart Display and Information System (ECDIS); ILO safe manning and impact on Port State Control.
14.	Management of Vessel Knowledge of management of vessel including leadership, decision making, problem solving, communication, goal setting, systematic approach to vessel maintenance, vessel safety and environmental protection, management of personnel, cargo and vessel; conflict of interest and rights of accused; services provided by consuls abroad; IMO, ILO, SOLAS, MARPOL, and contribution of such organizations in establishing Port State Control authority; <i>Ports and Harbours Act</i> and by-laws; conduct of vessels under foreign jurisdictions, including infractions, convictions, liens, vessel detention and arrest, and procurement of legal advice; maintenance regime for inspection, deployment, and testing of safety-related devices, machinery and equipment; maintenance logs; documentation and record keeping; mandate and powers of the TSB; casualty investigation; reports and process for implementation of safety practices; <i>Workers' Compensation Act</i> , including reporting procedure and witnesses; penalty for non-compliance.
15.	Salvage Knowledge of master's responsibilities in the event of salvage and salvage agreements; Lloyd's Standard Form; justifiable deviation; limitation of liability; salvage associations; implications of CP/BL before taking a vessel in tow.
16.	Emergencies Knowledge of masters obligations and responsibilities in the event of emergencies, collision, distress, search and rescue; knowledge of search and rescue procedure as detailed in CANMERSAR.
17.	Vessel Reporting System and Services Awareness of vessel traffic services and reporting system in eastern, western and arctic waters of Canada (ECAREG, NORDREG); master's obligation to report; traffic schemes and IMO approval process; AMVER and MAREP reporting systems.
18.	<i>Criminal Code</i> Knowledge of the provisions of the <i>Criminal Code</i> that affect mariners; Minister's right to cancel or suspend certificate of competency; summary convictions and indictable offences.
19.	Agents Knowledge of appointment of agents; authority and duties of an agent; types of agents; scope of services provided; sub-agent and delegation of authority.
20.	Port of Refuge Knowledge of the business aspects of putting into port with damaged ship or cargo; justifiable deviation; general average; note of protest; right to extend; differences between general and particular average; survey of cargo; certificate of seaworthiness; survey procedure and associated documentation; underwriters; tender clause; conduct of vessel under foreign jurisdiction; procurement of legal advice; process and procedure, including incident investigation and analysis; technical report; damage report and repair specifications.

Note: The following open-book resources will be allowed in the examination room:
Canada Shipping Act
Pilotage Act
Carriage of Goods by Water Act
The examination consists of a written test.
Duration is two hours.


11.9 Cargo
Examination number 123

ITEM	COLUMN
1.	<p>Bulk Grain and Timber Deck Cargoes</p> <p>Preparation of vessel for Department of Agriculture authorization to commence loading; presentation to port warden; understanding and application of the grain cargo regulations, Canadian grain rule equivalent and Chapter VI of SOLAS 1974 (amended 1983) for the safe stowage, security and carriage of various grain cargoes; ability to draw up a proposed loading plan and complete the stability calculation form for ocean and sheltered waters voyages for port warden's approval prior to commencement of loading.</p> <p>Preparation, stowage and securing of vessel to load timber cargoes including logs, pit props, saw lumber (loose or packaged) below deck, on deck and on deck of vessel having timber loadlines; understanding and application of the timber cargo regulations and Canadian code of safe practices for ships carrying timber deck cargoes for the safe stowage, stability, securing and carriage of timber, height of cargo, protection of the crew, and safe practices; lashings, their tests, markings and certifications; water absorption and ice accretion.</p>
2.	<p>Safety and Precautions</p> <p>Safety aspects of shipment conditions; handling, safe stowage and carriage of bulk cargoes including ores, concentrates and materials as stated in code of safe practices for bulk cargoes; definitions, precautions, hazards, tests, specifications, contamination, corrosion; hazards of improper weight distribution resulting in structural damage; improper stability or reduction of stability during voyage; angle of repose, moisture migration, saturated ores and spontaneous heating.</p> <p>General precautions relating to stability; effects of high density bulk cargo; hold preparation, including bilges, pipes and service lines; ventilation systems, dust intakes; moisture content, transportable moisture limit, sampling conditions; description of tests, certificates and questionnaire.</p> <p>Preparation of proposed loading plan; stability data and submission to port warden for approval prior to loading; clearance from port warden on completion of loading and before sailing.</p>
3.	<p>Loading, Securing and Carriage of Containers</p> <p>Containers, international dimensions, main container types, materials used in their construction, periodic inspections and certification procedure, various container handling methods; loading and securing arrangements on various types of vessels including container ships, ferries, ro-ro ships, oil and bulk ore ships, conventional ships and converted bulk carriers; securing and lashing systems, fittings provided, materials used, special strengthening of decks and permissible height of containers on deck. Safe stowage and securing of containers on decks of vessels that are not specially designed and fitted for the purpose of carrying containers.</p>
4.	<p>Refrigerated Cargoes</p> <p>Trading patterns and use of specialized refrigerated ships, general cargo ships fitted with refrigerated lockers; refrigerated containers and other modes; special carriage requirements of various refrigerated cargoes and separation of non-compatible cargoes; preparation and inspection procedure of compartments, loading, carriage and discharging arrangements, stowage principles and safe carriage requirements; special trade and commodity requirements, shipper's instructions and joint deck and engine department responsibilities for safe carriage; need for maintenance of accurate records of compartment temperatures at all times; palletised and unitised refrigerated cargoes; conditions for loading, stowage, carriage and discharging arrangements, malpractice in handling refrigerated cargoes; care and preparation of refrigerated compartments after discharge; types of refrigeration systems used and advantages and disadvantages of each.</p>

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5.	<p>Livestock Definition of livestock; patterns for the transportation of livestock; specialized ships, ships converted for the purpose, additional manning and ventilation requirements. Safety and human conditions for carriage of livestock; preparation, inspection, certificates; pens, cages, stalls; loading and discharging method and equipment used; en route care, feeding, water, sanitary facilities, illness, overcrowding, segregation, protection from injury, undue exposure to weather and sea-sickness provisions. Transportation of animals entering or leaving Canada by sea carriers; disposal of injured animals, carriage of veterinary drugs; maintenance of reports, records, permits, licenses and list of quarantine ports in Canada; reports on completion of voyage.</p>
6.	<p>Bulk Liquid and Gas Cargoes Bulk liquids: ship types; tank types, installation, design and construction; requirements for the carriage of various liquid cargoes; ship arrangement, cargo segregation, accommodation spaces, cargo pump rooms, access to cargo tanks and other spaces in the cargo tank area; cargo transfer piping arrangements, cargo transfer control systems, cargo hoses and pipe lines; tank vent systems, types of tank vent systems; cargo temperature control, additional requirements; material of tank construction and coatings; gauging ullage; vapour detection, requirements for individual substances; ventilation in cargo handling spaces, spaces normally entered, spaces not normally entered; environment control; ballast tank arrangements; bilge pumping arrangements, pumps and pipe line identification; electrical requirements, installations in pump rooms, cargo tanks, open deck, bonding and requirements for individual substances; fire protection, fire safety arrangements, inerting, inerting systems, fire extinguishing systems; tank filling; personal protection requirements; sample taking; maximum allowable quantity per tank; tank washing methods, tank entry; tank heating; personnel training and cargo information; overflow control. Gases: ship characteristics and cargo containment; gases and their properties; potential hazards to health, toxicity, acute and chronic effects of toxicity, cryogenic and toxic effects on skin, IMO first aid guide; flammability and explosion, sources of ignition, insulating flange; environment hazards; re-liquefaction and boil-off control; instrumentation, liquid level gauges, ultrasonic gauges etc., level alarm and automatic shut down, temperature-monitoring devices; safe practices, procedures and precautions for entry into enclosed spaces; gas monitoring equipment, fixed and portable; personnel safety equipment, clothing and personal protection; shipboard emergency plan, organization and planning; personnel emergencies; cargo spillage; cargo overflow; cargo handling equipment; emergency shut-down; overflow control.</p>
7.	<p>Damaged Cargo Cargo damage associated with the history of the voyage, discovery of such damage at intermediate ports or at final port; damage, shift or loss of cargo discovered at sea with survey being held upon arrival at next port; damage, shift or loss of cargo that is so severe as to endanger or damage the ship, necessitating deviation from voyage and putting into the nearest port to effect necessary corrections or repairs. Technical aspects of putting into port; appropriate log entries on discovery of cargo damage and steps taken to rectify the situation; advising the owners; deciding on a port of refuge and requesting entry from port authorities; noting of protest with right to extend; informing classification society and their agent and underwriters; declaration of general/particular average; arrangement of survey; correction of the problem and necessary repairs etc; obtaining a certificate of seaworthiness or interim certificate of class after due inspection; maintenance of all records of times, positions and quantities of fuel, fresh water and stores at the time of deviation; expenses to the account of all parties involved, details of expenses to be noted; informing owners, obtaining clearance and departing in the usual manner. Survey of cargo if no recognized surveyor available and purpose of survey.</p>

<p>8.</p>	<p>Practical</p> <p>Practical considerations in loading, carrying and discharging cargo on container ships, self-unloaders, ro-ro vessels, liquid gas carriers, oil and chemical tankers, and passenger vessels.</p> <p>Container ships: loading of standard-size containers handled by methods that, in turn, depend upon the operation and method by which the container is strengthened; protection of cargo, reduction in pilferage, speed of loading and discharging increased for a quicker turn around; effect of length of bulky cargo in container. Self-unloaders: tackle requirements, application to self-unloaders; code of safe working practices for self-unloading vessels.</p> <p>Ro-ros: tackle requirements, application to ro-ro ships, specially-designed terminal to load and unload; advantages, greater net cargo capacity and greater ship utilization. Liquid gas carriers: design dependent upon the type of cargo to be carried, conditions of carriage, fully-pressurized semi- refrigerated or fully-refrigerated, type of trade and terminal facilities; cargo containment systems, independent, membrane, semi-membrane, integral or independent tank type; liquid natural gas (LNG) carriers generally transport LNG at its atmospheric pressure boiling point of -162° C; gas carriers not permitted to have a pump room, submersible cargo pumps used for cargo discharge; cargo tanks not used for ballast purposes, separate ballast tanks; gas tankers, fixed water spray system for fire protection, covering cargo tank domes, fitted dry powder installation for cargo area fires.</p> <p>Oil and chemical tankers: loading practices; physical and chemical properties of crude oil, stabilized crude, sour crude and spiked crude; saturated vapour-pressure, vapour/temperature relationship, boiling point, influence of pressure on boiling point temperature, Reid vapour-pressure, flash point, flammable range, upper and lower flammable limit, relationship between flash point, and lower flammable limit; principle of controlled cargo tank atmosphere; static electricity during loading, discharging, tank washing, gas freeing, clearing lines, electrical storm, flammability and explosion hazards, gas concentration at deck level, tank coating in relation to gas retention; piping arrangement, ring main and free flow systems; practical operation of cargo pumps, drop line, eductors; control equipment for drainage; pre-planned loading/discharging procedure; safety considerations, checklists, ship/shore liaison; communication; general precautions; inerting and purging operations; ship to ship transfer procedure; tank cleaning, static generation, tank cleaning in controllable atmospheres; precautions, procedures, tank cleaning in inerted atmospheres, action to be taken in case of inert gas system failure, fixed tank cleaning systems; crude oil washing system, cargo pump, eductors, checks required before crude oil washing, aborting crude oil washing; oil pollution sea and air, chemical dispersing agents and their use; load on top and crude oil washing; ballast after crude oil washing, tank inspection after crude oil washing; pumping arrangements, remote controls for pumping equipment; action in event of fire, grounding spillage and failure of services essential to cargo; portable and fixed measuring instruments, their function, interpretation and calibration of combustible gas indicators and oxygen analyzers, toxic gas determination, procedures for entry into pumprooms, tanks and gas dangerous spaces, enclosed space entry permits and check lists; tank rescue equipment; protective clothing and equipment, resuscitation equipment; Toxic Limit Value, acute and chronic effects of toxicity, health hazards, effects of crude oil, distillates, sulphuric acid (H₂SO₄), aromatic and leaded fuels; mooring operations, ship/shore and pollution prevention check list.</p> <p>Passenger Ships: regulatory requirements for the carriage of radioactive substances, corrosive, poisonous, dangerous goods, (solids or liquids), gases (compressed, liquefied or dissolved under pressure), inflammable (solids or liquids), oxidizing substances; refrigerated goods, automobiles and livestock in small or large quantities in bulk or container on ships carrying berthed or unberthed passengers; classification, documentation, packaging, marking, labelling, segregation and stowage requirements; requirements for ventilation, fire prevention, fire fighting and safety of passengers and crew.</p>
<p>9.</p>	<p>Voyage Planning:</p> <p>Loadlines and seasonal loadline zones act as a safety factor for seafarers and ships to protect against overloading at the time of planning a voyage, at its commencement, during the voyage and on arrival at the destination port.</p>

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10.	<p>Law</p> <p>Grain Loading Regulations, Timber Deck Cargo Code and Regulations, Code of Safe Practices for Solid Bulk Cargoes, Deck Cargo Safety Code, <i>Safe Container Convention Act</i>, International Maritime Organization Dangerous Goods Code; International Maritime Organization Oil Pollution Convention 1954 and amendments 1961, 1969, 1971; Marine Pollution Convention (MARPOL) 1973, 1979 and Protocol; Clean Seas Code, Dangerous Goods Shipping Regulations; <i>Animal Disease and Protection Act and Regulations</i>; Chapter VI of Safety of Life At Sea Convention (SOLAS) 1974 (amended 1983); <i>International Chamber of Shipping Oil Tanker Safety Guide</i>; <i>International Chamber of Shipping Guide to Helicopter Operations</i>; classification societies; independent insurance surveys, acceptance, safe loading, stowage and carriage of dangerous goods; safety and emergency procedure for ships carrying dangerous goods.</p> <p><i>Canada Shipping Act</i>; port wardens, duties and powers, services, inspection, documentation; cargo surveys, disputes, damaged cargo.</p>
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Note: The examination consists of a written test.
Duration is two hours.

11.10 General Seamanship
Examination number 163
Companion to Section 15.13

ITEM	COLUMN
1.	<p>Manoeuvring Information</p> <p>Tables of stopping distances; turning circle diagrams and derivation of appropriate information of ship characteristics.</p>
2.	<p>Ship-Handling, Routine</p> <p>Fixed- or controlled-pitch propeller or propellers, transverse thrust, turning ahead or astern; vessel pivoting point when manoeuvring with headway and sternway; head reach and stern reach; effect of cavitation and wake current; rudder force and manoeuvring of twin screws; sail effect of vessel superstructure; berthing, unberthing and use of the water wedge in ship handling; locking and unlocking a vessel; anchoring to a single bower anchor; anchoring to a stern anchor, mooring to two anchors; mooring to buoy; turning a vessel short round; bank suction and cushion effect in narrow channels; the effect of shallow water resistance on ship's behaviour; use of mooring lines and ground tackle in all circumstances; the use of tugs in manoeuvring.</p>
3.	<p>Ship-Handling, Exceptional</p> <p>Practical handling and managing a ship in exceptional circumstances, loss of or damage to rudder and the use of auxiliary means of steering; steering by screws; rigging jury rudder or jury steering gear; damage control in case of collision, grounding, fire, explosion or other accident; procedure when grounded and methods of refloating; procedure when beaching a vessel; procedure in case of wreck with emphasis on preservation of life, methods of abandoning a wrecked vessel; steps to be taken when disabled and in distress; taking and being taken in tow; rescuing crew of a disabled vessel or person in the water; manoeuvring in bad weather, heaving to and running before a sea; dangers of being pooped; keeping head to sea; the use of oil in bad weather and rescue operations; keeping a disabled vessel out of trough and lessening lee drift.</p>
4.	<p>Ship-Handling, Unusual</p> <p>Practical handling and manoeuvring a ship in unusual circumstances; retrieval of man overboard; procedures in ice, alone or in convoy, and movements to be expected by an ice breaker with reference to Transport Canada publication <i>Ice Navigation in Canadian Waters</i>; search and rescue procedures, including the responsibilities of the on-scene commander, with reference to MERSAR, CANMERSAR and Transport Canada publications; precautions to be taken in bad weather.</p>

5.	Dry-Docking Procedures and precautions observed when dry-docking, effect of distribution of weight, dry-docking with a full cargo, use of bilge blocks; dry-dock inspections and precautions to be observed in dry-dock; procedure to be followed prior to and during refloating.
6.	Duties and Responsibilities of the Master On first joining a vessel; official documents on board a vessel; issuance and understanding of standing, general, night and special orders; berthing and unberthing under all conditions; manoeuvring a vessel and assessing risks involved; under way, in port, or at anchor under all circumstances and conditions, shipboard, local and general emergencies of any nature; verifying information on the ship's manoeuvring characteristics, determining approximate manoeuvring data and recording the ship's manoeuvring peculiarities; setting and manning the watches according to regulation and during exceptional circumstances; organizing the crew and other persons for routine operation and emergencies of all kinds; maintaining equipment in good condition.
7.	Regulations Collision Regulations with Canadian Modifications 1983; Canadian Buoyage System; Code of Nautical Procedures and Practices; <i>Canada Labour Code, Part II</i> ; WHIMIS.

Note: This examination is oral.
Duration as necessary.

11.11 Astro and Electronic Navigation Examination number 052

ITEM	COLUMN
1.	Position Fixing Systems Principles of position fixing by Decca and Loran; measurement of difference of distance from two or more fixed points; the use of radio waves to obtain difference of distance by measurement of time and phase difference; generation of hyperbolic curves, families of curves and lattices on charts, curves when fixed points are a short distance apart; causes and nature of fixed and variable errors of the Decca and Loran systems.
2.	Radar Description of the principles of radar; outline of a radar system using a block diagram to illustrate the essential functional units required in radar equipment, and a description of the functions of those units; characteristics of a radar set that determine the quality and accuracy of navigational information, and measurement at sea of the set's relative standards of performance; effects of operational controls that affect performance; effects and recognition of sub-standard performance; effects of improperly adjusted controls; capabilities and limitations of radar, factors and their effects that may limit the detection of objects and the display of echoes.
3.	Echo Sounders Description, with aid of block diagrams, of a typical navigational echo-sounding system indicating functions and characteristics of units; visual indicators and recorders, phased scales, transmitters and receivers; sounding repetition rates, accuracy of soundings, maximum and minimum depths in navigational sounders; interference on display; internal and water noises.
4.	Direction Finders Description, with the aid of a block diagram, of the rotating- and fixed-loop systems; advantages and disadvantages of the rotating- and fixed-loop systems and the manual and automatic systems; compass stabilization; instrument errors that affect the accuracy of direction finding (D/F) equipment; effects of ship super structure and aerials on bearing accuracy, quadrantal and semi-circular errors and their compensation; relationship between frequency and effect of rigging and aerials; calibration; capabilities of D/F equipment as an aid to navigation; use of independent and synchronized beacons; classification of bearings; propagational errors.

5.	<p>Magnetic Compass</p> <p>The laws of magnetism; terrestrial magnetism and the magnetic elements of the earth's field; construction of the magnetic compass and binnacle; effect of the ship's magnetic field on a magnetic compass; the components P, Q and R, their separate effects and their application to compensation of a ship's magnetic field; approximate coefficients A, B, C, D and E and their use; methods of obtaining a table of deviations, analysis of the table to obtain approximate coefficients; general principle of compass correction and methods of correcting for coefficients B, C and D; cause and effect of retentive magnetism and Gaussing error; siting of compasses, with emphasis on the proximity of magnetic material and appliances; causes, effects and corrections of heeling error; effect of heeling error magnets on soft-iron correctors; use of vertical force instruments; principles of magnetic transmitting compasses and repeaters; compensation and adjustment of magnetic compass using the deviascope or instructional binnacle.</p>
6.	<p>Gyro Compass</p> <p>Properties of the free gyroscope; relationship between applied force and precession; effect of the earth's rotation on a free gyroscope, drift and tilt; errors associated with gyro compasses; latitude, course and speed error, ballistic deflection, rolling error; latitude, course and speed correction; fundamental classes of gyro compass according to control and dampening, operation of common modern types of gyro compasses; principles of operation of repeater systems, course recorders and automatic pilots, limitation and use.</p>
7.	<p>Navigation Space</p> <p>Voyage planning with respect to: available aids, radar, conspicuous objects, low and ice-masked coast lines; fuel consumption, economical speeds, estimate of minimum fuel consumption to complete a given voyage; propeller slip problems and effect on fuel consumption; principle used in HO/NP401 short method and ex-meridian tables; errors, most probable position; errors in position lines; navigation in high latitudes; rapid convergence of meridians; extreme refraction and false horizons; low horizontal intensity of the earth's magnetic field; chart projections, including non-triangulated chart and lack of detail; loss of accuracy in plotting; gyro compass limitations; extended twilight; majority of observations being low altitude; importance of maintaining DR; decreasing importance of error in time; front and back altitudes to offset refraction; extreme tidal conditions in high latitudes; slow rate of change of altitude in relation to azimuth; general consideration; maintaining track and estimated position; determination of the most suitable heavenly bodies; approximate setting on a sextant to observe any heavenly body; calculation of EP in heavy weather; Doppler and Inertial methods of measuring DR; and global positioning system (GPS).</p>


Note: The examination consists of a written test, including calculations.
Duration is three hours.
A practical test on the deviascope during which the applicant will be examined orally on item 5, duration as necessary.

11.12 Meteorology


Examination number 073

Companion to Sections 14.6, 18.8, 19.9 and 20.10

ITEM	COLUMN
1.	<p>Chemical Composition of the Atmosphere</p> <p>Water vapour, nitrogen, oxygen, argon, carbon dioxide, krypton, xenon, ozone; dust, hygroscopic particles, smoke, salt particles; micro-organisms (such as bacteria used as nuclei for artificial snow).</p>
2.	<p>Vertical Structure of the Atmosphere</p> <p>Troposphere, stratosphere, mesosphere, thermosphere and ionosphere; stratospheric clouds, nacreous and noctilucent, appearance, height limits, composition; optical phenomena, reflection, refraction, aureole, bishop's ring, corona, halo, mock sun or parhelion, rainbow, mirages, Saint Elmo's fire, northern lights, magnetic storms, phosphorescence.</p>
3.	<p>Transfer of Heat</p> <p>Radiation, conduction, convection, and turbulence.</p>

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4.	Temperature Related to the atmosphere and the earth; calorie, specific heat of water and earth; perpendicular and oblique radiation; selective absorption of radiation by the atmosphere; isotherm; temperature and distance of the sun.
5.	Atmospheric Moisture and Changes of State Heat of fusion, vaporization and sublimation; latent heat; relative and absolute humidity, saturation, supersaturation and supercooling, dew point; lapse rates, adiabatic cooling, dry and saturated lapse rates.
6.	Atmospheric Stability Stability, instability, conditional instability, potential instability; causes of inversions, radiative cooling, turbulence or convection, subsidence; effects of inversions, fog and low-lying cloud, smog, accumulation of smoke; causes of subsidence; effects of substances, compression heating, evaporation.
7.	Fog Definition, formation; season, locality and frequency of occurrence; major types, advection, radiation, frontal, sea smoke; anomalous propagation of sound in fog, mist, haze, smog.
8.	Clouds Formation, convection, turbulence, frontal, convergence, orographic; types, stratus, cumulus, stratocumulus, nimbostratus, cumulonimbus, altostratus, altocumulus, cirrus, cirrostratus, cirrocumulus.
9.	Precipitation Theories explaining the formation of precipitation; relative sizes of condensation nuclei, cloud droplets, drizzle drops and rain drops; types, convective, frontal, orographic; forms of precipitation, dew, frost, rain, snow, sleet, hail, snow pellets, snow grains, ice pellets, diamond dust, rime.
10.	Lightning Theory of formation; associated clouds, conditions within the clouds; times, seasons and localities of occurrence.
11.	Pressure and Pressure Systems Definition; Coriolis effect; convergence and divergence; highs and lows, standard atmosphere (1013.25 mbar); isobar, isobars, diurnal pressure variation, effect of diurnal pressure variation on detection of tropical revolving storms, isobaric patterns and pressure gradients, pressure gradient, terminology, deepening or filling low, weakening or filling high, shallow (weak) pressure gradients, steep (strong) pressure gradients; patterns, troughs, ridges, cols; types of depression, polar front low, thermal depression, vertical instability depression (e.g., tropical revolving storm); straight isobars, effect of straight isobars on wind, on weather.
12.	Winds Definition, speed (knots and Beaufort scale); direction, veering and backing, calculation of pressure gradient, geostrophic wind, gradient wind, centrifugal force, Buys Ballot's law, cyclostrophic wind, effect of latitude and friction on wind speed, effect of latitude on geostrophic wind scale, absence of surface friction above 2000 feet, angle of indraught (15° at sea, 30° over the land); special wind effects, land and sea breezes, anabatic and katabatic winds, Fohn effect (chinook), gusts and squalls; monsoons, theory of monsoon formation, land and sea breezes compared to monsoons, pressure and weather characteristics associated with monsoons in the Indian Ocean and monsoons in the Chins Sea; global systems circulation, seasonal modification and permanent pressure systems; intertropical convergence zone, trade winds, horse latitudes, westerlies, roaring forties, polar front, semi-permanent highs (Atlantic and Pacific), polar highs, Icelandic and Aleutian lows, effects of land; local winds, locality, season and prevailing direction of following winds, levanter, vendevals, mistral, bora, sirocco, gregale, etessain, khamsin, simoon, shamal, kaus, elephants, brick fielder, williwaw, harmattan, norther, tehuantepecer; upper air circulation and jet stream, thermal wind, isohypses, Rossby waves, flow patterns at 500 mbar, steering rule.
13.	Air Masses Definition; source regions; identification; characteristics; modification; seasonal movement (North America and offshore); types, continental arctic, continental polar, continental tropical, maritime arctic, maritime polar, maritime tropical, equatorial.
14.	Fronts Definition; types, stationary, cold, warm, occluded; movement; sequence of weather associated with fronts, pressure, wind, temperature, cloud, weather, visibility; squall lines, definition, association with cold fronts, weather experienced with squall lines, pressure, wind, temperature, cloud, weather, visibility; areas of occurrence; local names (e.g., pampero, southerly buster).

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15.	Families of Depressions or Extra-Tropical Cyclones Formation between two air masses, life cycle and movement cross section, associated weather, frontogenesis, frontolysis, secondary depressions.
16.	Waves and Swells Difference between seas and swells, definitions of period, height, length, speed, steepness, fetch; wave groups, waves in shallow water, ground swell, breakers and surf; swells in forecasting tropical revolving storms; effects of coast, currents, tide; storm surge; effect of ice on waves, ice crystals, pack ice; tsunamis and tidal waves, description, epicentre, dangers, tsunami warning system, true tidal waves and tidal bores; seiche.
17.	Oceanic Currents and Effect on the Climate Definition of set and drift, wind-drift currents, gradient currents, complex currents (including stream currents), Coriolis effect and Ekman's spiral, upwelling, permanent currents, seasonal currents; general surface circulation and offshoots in North American waters, geographical limits, seasonal variations, direction, strength; effect of currents on climate, warm, cold; knowledge of the various currents of the world.
18.	Tropical Revolving Storms Definition of path, track, vertex or cod, vortex or eye, trough line, angle of indraught, dangerous semi-circle, dangerous quadrant, navigable semi-circle; features distinguishing it from extra-tropical cyclone, small diameter, steeper pressure gradient, winds tangent to central isobars, eye absence of fronts; warnings, radio messages, projected track, unusual swell, appearance of the sky, unusual changes in wind strength and direction, corrected drop in barometric pressure; weather associated with tropical revolving storms; sources of energy; seasonal distribution; practical rules for avoidance; hurricane and typhoon anchorages; mandatory reporting; names and season for tropical storms in the following areas: the North Atlantic, the western North Pacific, eastern North Pacific, South Pacific, Bay of Bengal, Arabian Sea, western Indian Ocean, eastern Indian Ocean.
19.	Ice Formation and Decay Freezing of fresh and salt water; formation of land ice; Greenland and Antarctic ice caps, glaciers; ice types and egg code; types of ice, new, frazil, grease, slush, shuga, nilas, pancake, young, grey, grey-white, first-year, second-year, multi-year, fast ice, pack ice, ice of land origin, forms of floating ice (floe sizes); ice fields and their movement, icebergs and drift, iceberg routes, limits, seasons, reasons for variation in numbers, difference between northern and southern hemisphere icebergs; presence of icebergs in North Pacific, North Atlantic lane routes, International Ice Patrol; icing of superstructures, causes, fog, freezing drizzle, freezing rain, freezing spray, serious accumulation above 04; avoidance, shelter, warmer water, alteration of course and speed; mandatory reporting, freezing temperatures, high winds.
20.	Ice Detection and Reporting Ice blink, absence of sea swell, problems associated with radar, limitations due to poor visibility, liaison with shore reporting stations; receipt of ice advisory broadcasts, ice advisory service, shipping support service, interpretation of ice charts; <i>Canadian Waters and Manice</i> , ice climatology and ice operations, ice navigation in Canadian waters; instrumentation, thermometers, dry bulb, wet bulb, marine screen, psychrometer, seawater temperature bucket; barometer, units, corrections, diurnal variations; barograph; wind measuring instruments; observations and weather reports, auxiliary ship, selected ship; climatology and forecasting, purpose, avoiding damage from storms, improving passage time, holding course in fine weather.
21.	Weather Messages and Codes International analysis in code, definition, interpret messages; plot pressure systems, fronts, isobars; forecast 12-24 hours, pressure, wind, sea state, visibility, clouds, weather changes; knowledge of services available; <i>Radio Aids to Marine Navigation, Atlantic and Great Lakes Pacific</i> ; ability to locate marine weather forecast areas; understanding weather forecasts for the Great Lakes, ability to use MAFOR code; assorted weatherfax, weather, satellite, sea state, and ice charts; synoptic charts, surface and upper air; recognition of isobaric distribution patterns; comparison with earlier charts; knowledge of information available on weatherfax in Canada and worldwide; understanding of synoptic surface analysis charts; understanding of surface progs; understanding of wave charts, analysis, forecast; understanding of ice charts; ability to forecast the following for 12-24 hours: pressure, wind, sea state, visibility, clouds, weather changes.
22.	Optimum Weather Routing Advantages, reduce storm damage, save time, meet special requirements; methods, on board ship, through shore-based firm, through government departments; climatological routing, in areas with stable weather patterns; optimum routing, geography does not dictate track, travel time is more than three days or 1500 miles; data and long-range progs are available.

23.	<p>Requirements</p> <p>Application of ship's performance curves and sea data; use of surface analysis and prog charts; use of 500 mbar constant pressure charts for estimating storm track; use of ice charts, wave charts; practical drawing of optimum tracks embracing the use of polar stereographic or gnomonic charts, ship performance curves and locus positions; factors that require a continuous updating and revision of weather routing procedures.</p>
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Note: The examination consists of a written test comprising multiple-choice and descriptive questions.
Duration is three hours.

11.13 Not used

11.14 Ship Construction and Engineering Knowledge Examination Number 133

ITEM	COLUMN
1.	<p>Loadline Conditions of Assignments</p> <p>Knowledge of conditions of assignments to vessels; requirements for vessels to undergo periodical surveys for compliance with the conditions.</p>
2.	<p>Tonnage Rules</p> <p>Knowledge of the method of calculating GRT and NRT under the old and new tonnage regulations.</p>
3.	<p>Ship repairs</p> <p>Knowledge of repair specifications and preparations to facilitate repairs to ship's structure.</p>
4.	<p>Navigation in Ice</p> <p>Knowledge of vessel features that provide adequate strengthening for navigation in ice; problems encountered by cooling system and precautions to be taken to prevent occurrence of cooling problems.</p>
5.	<p>Structures and Construction Methods</p> <p>Knowledge of structural stresses; difference between stress and strain; sheer force and bending moments and interpretation of graphical solutions; types of welded joints; faults; methods of inspection and testing for detection of faults; types of bow and stern construction from profiles; components that make up the fore and after end of a vessel; double-bottoms construction and naming of parts; reasons for extra strengthening; tests conducted before putting into service; watertight and fire resistant deck and bulkheads; requirements for decks and bulkheads to be classed as watertight and/or fire resistant; requirements for doors to be classed as watertight; importance of subdivision in ships for fire protection; closing and sealing appliances used in decks and bulkhead penetrations to maintain watertight/fire tight integrity; special construction features of deep tanks; special closing arrangements for deep tanks to maintain watertight integrity; fittings on hatchways designed to maintain watertightness; special construction features of deck fittings to maintain weather and watertightness of decks; difference between superstructure and deck house; special construction requirements of superstructures and deckhouses; distinguishing construction features of ro-ro vessels and methods to maintain their hull strength and watertightness; classes of icebreakers, special construction features of icebreakers and construction requirements for a vessel to be classed as an icebreaker; special construction features of catamarans and construction methods employed to ensure adequate strength is maintained; special construction features of container and hatchless container ships, special strengthening arrangements to provide longitudinal strength, additional strengthening in double bottoms to compensate for point loading of tiers of containers; special construction features of passenger/vehicle ferries, special arrangements in passenger ferries to limit flooding and the spread of fire as required by SOLAS; special construction features of liquefied gas carriers and identification of various codes related to their construction and equipment; special construction features of VLCCs and special methods employed to ensure adequate longitudinal and transverse strength; special construction features of OBOs.</p>
6.	<p>Shipyards</p> <p>Knowledge of the procedures and practices used by shipyards for the construction and repair of vessels; necessity of dock and sea trials for vessels.</p>

7.	Stresses in Ships Knowledge of predominant stresses when unloading bulk carriers with grabs and by uneven off-loading; predominant stresses on bulk carriers when loading concentrates or other bulk products at a high rate; uneven distribution of cargo; heavy weights on deck or tank tops; stresses on hull caused by motion of a vessel at sea, including panting, pounding, hogging, sagging and racking; structural stresses when grounded.
8.	Hull Knowledge of internal and external damage assessment resulting from structural damage, corrosion and waste; assessment of damage and preparation of reports using general arrangement or other related vessel drawings; effect of special steel on design and structure; advantages and disadvantages of using specialized steel in ship construction.
9.	Engine Room Arrangement Knowledge of layout of main engines and auxiliaries in steam-turbine propulsion; diesel-engine propulsion; and diesel-electric propulsion.
10.	Shaft Train Knowledge of construction and arrangement of a water-lubricated and oil-lubricated type stern tube; major components of transmission systems; construction and working principles of a thrust block; construction and working principles of a shaft bearing; construction and fitting arrangement of a fixed propeller to the tail shaft; working principles of a controllable pitch propeller.
11.	Remote Control Knowledge of the sequence of operation of bridge control for main diesel engines; imposed conditions and essentials for critical speed and reversing of main engines; essential elements of a control system with reference to proportional action, integral action, derivative action and multiple-term controllers; arrangements for a manual override.
12.	Steering Systems Knowledge of the operating principles of a kort nozzle; advantages and disadvantages of a kort nozzle; operations of the jet or hydraulic thrust Bow Thruster System; operating principles of twin rudders; advantages and disadvantages of twin rudders utilizing independent control; operation of an azimuthing CP thruster arrangement.
13.	Fuel Oil Knowledge of the importance of the fuel characteristics including density, viscosity, flash point, cloud point, pour point, water content, sulphur content; safety precautions during bunkering; fuel oil calculations using provided information to calculate consumption, most economic speed, estimating fuel consumption to complete a voyage, slip percentage.

Note: The examination consists of a written test.
Duration is three hours.


11.15 Not in use.

11.16 Engineering Knowledge

Examination Number 132

Companion to Section 12.9

ITEM	COLUMN
1.	Ship Piping Systems Knowledge of bilge system , ballast system, cargo piping system, and oily-water separator.
2.	Steering Arrangements and Controls Knowledge of steering gear rules and design, rudder types, hydraulic steering gears, electro-hydraulic steering gears, duplex steering arrangement, quadrant and tiller system, emergency steering, hydraulic rotary-vane steering gears, automatic steering systems, auto pilot system, and steering gear testing.

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3.	Deck Machinery Knowledge of general arrangement of deck machinery, main drivers used on deck auxiliaries, anchor handling equipment, windlass arrangement, mooring equipment, automatic and manual mooring winches; cargo handling arrangements including derrick rig systems, heavy lifting system, deck cranes, cargo cranes, grabbing cranes, self-unloading systems, hatches including types of mechanically-operated hatch covers; and lifeboat davits.
4.	Fire Detection and Extinguishing Systems Knowledge of smoke and heat detectors; fire extinguishing systems; inert-gas smothering system; self-contained inert-gas generator; inert-gas system taken from boiler uptake; CO ₂ as a fire smothering agent, rules and regulations for operation of CO ₂ system, CO ₂ flooding system for cargo holds, CO ₂ total flooding system for machinery space, CO ₂ activation alarm system, bulk CO ₂ system under refrigeration; fire extinguishing mediums, when and how to use them; fire alarms, manually operated, fire alarm switches, shut off machinery spaces, remote stations; emergency shut off device on fuel tanks; vaporizing fluids, halon 1301 and 1211; main fire pump, emergency fire pump; fire mains, valve used on a hydrant; purpose of international shore connection; hydrants and hoses; reasons why hoses are tested.
5.	Control Systems Knowledge of local and remote-control systems; alarm systems, bilge-level alarm, main engines, pneumatic controls; controllable pitch propeller; remote starting-up and shutting off; manoeuvring of single- and multi-engines; thrust units; hydraulic control system; panel instruments; computer control of pumping systems.
6.	Depth Measuring Instruments Knowledge of pneumatic gauge, float tank gauge, distant reading tank float gauge; effects of trim and heel; limitations of each gauge when measuring tank depth or draught measuring.
7.	Emergency Batteries Knowledge of lead acid batteries on ship; installation procedure for series and parallel operation; rating of batteries; function of a hydrometer; causes of battery failure; reasons for slow charging; safety precautions and maintenance required; visual inspection procedure.
8.	Main Engines Precautions taken before starting a direct drive propulsion unit in lubricating oil, fuel oil, jacket water, starting air systems.
9.	Pumps Knowledge of centrifugal pumps, single-stage pump; multi-stage pump; rotary displacement pump; gear pump; screw displacement pump; double-acting piston pump; piston displacement pump.
10.	Uninterruptable Power Supply (UPS) Knowledge of UPS for computer and control system, operation; preventative maintenance.
11.	DC and AC Propulsion Systems Knowledge of characteristics, major differences in circuits; advantages and disadvantages of electric-drive propulsion systems; difference in drives in terms of required components for turbo-electric drive and diesel-electric drive, respectively.
12.	Self-Unloading Vessels Knowledge of cargo-handling tunnels; gate structure types; self-unloading booms; advantages and disadvantages of each type; belt/bucket system; attachments to booms, precautions for safe operation.

Note: The examination consists of multiple-choice questions, calculations and simple drawing questions.
Duration is two hours.