CHIEF ENGINEER STATUTORY AND OPERATIONAL REQUIREMENTS

Attempt ALL questions
Marks for each part question are shown in brackets

1. With reference to the International Maritime Organisation (IMO):

   (a) state SEVEN of the main matters considered by the Maritime Safety Committee (MSC); (7)

   (b) list THREE other main committees of the IMO. (3)

7/10

2. With reference to the MARPOL Convention:

   (a) list FIVE *Particularly Sensitive Sea Areas* (P.S.S.A.); (5)

   (b) outline the general requirements for vessels transiting P.S.S.A. (5)

3/10

3. (a) List SIX items of information that should be conveyed to the relieving officer, prior to taking over the engineering watch at sea. (6)

   (b) State FOUR criteria which should be taken into account when deciding on the composition of the engineering watch. (4)

10/10

4. With reference to the International Load Line Convention:

   (a) sketch and label a typical load line marking for a vessel certificated to operate in all zones; (5)

   (b) define statutory minimum *freeboard.* (2)

   (c) explain why there are different load lines for fresh water and sea water. (3)

5/10

5. With reference to the Code of Safe Working Practice for Merchant Seafarers (COSWP):

   (a) state THREE possible medical effects of inhaling asbestos dust; (3)

   (b) list THREE areas on a vessel where asbestos may still be present; (3)

   (c) state FOUR actions that should be undertaken if loose asbestos is discovered. (4)

10/10

6. With reference to Classification Societies:

(a) state their functions; (3)

(b) describe the role of the International Association of Classification Societies; (4)

(c) list THREE members of the I.A.C.S. (3)

7. With reference to plant monitoring as part of a planned maintenance system:

(a) list FIVE machinery faults that can be detected by means of vibration analysis; (5)

(b) outline TWO vibration parameters that are used for diagnostic work, stating the information EACH gives on the condition of the machine. (5)

8. With reference to vessel's survey requirements:

(a) state the possible consequences of either failing to obtain, or failing to renew a Statutory Certificate; (5)

(b) state what is meant by the *Harmonisation system of survey and certification.* (5)

9. (a) Describe the basic construction and operation of a Marine Travel Lift. (5)

(b) List THREE advantages and TWO disadvantages of a Marine Travel Lift. (5)

10. List the essential requirements for an effective fire drill. (10)

1. With reference to the International Maritime Organisation (IMO):

(a) state SEVEN of the main matters considered by the Maritime Safety Committee (MSC); (7)

(b) list THREE other main committees of the IMO. (3)

Q1

(a) Seven main matters considered by the Maritime Safety Committee (MSC): (7 marks)

1. **Safety of navigation** – including routeing systems, ship reporting, and aids to navigation.
2. **Life-saving appliances and arrangements** – lifeboats, life rafts, personal safety equipment.
3. **Fire protection, detection and extinction** – shipboard fire safety standards.
4. **Maritime security** – implementation of the ISPS Code.
5. **Standards for ship design and construction** – subdivision, stability, and structural safety.
6. **Carriage of dangerous goods** – including the IMDG (International Maritime Dangerous Goods) Code.
7. **Pollution prevention matters related to safety** – in coordination with the Marine Environment Protection Committee.

(b) Three other main committees of the IMO: (3 marks)

1. **Marine Environment Protection Committee (MEPC)** – deals with prevention and control of pollution.
2. **Legal Committee (LEG)** – considers legal matters such as liability and compensation.
3. **Technical Cooperation Committee (TCC)** – assists developing countries in implementing IMO conventions.

(Alternative correct answer: **Facilitation Committee (FAL)** – promotes simplification of port and shipboard formalities.)

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2. With reference to the MARPOL Convention:

(a) list FIVE *Particularly Sensitive Sea Areas* (P.S.S.A.); (5)

(b) outline the general requirements for vessels transiting P.S.S.A. (5)

Q2

(a) List FIVE Particularly Sensitive Sea Areas (PSSA): (5 marks)

Examples of IMO-designated PSSA include:

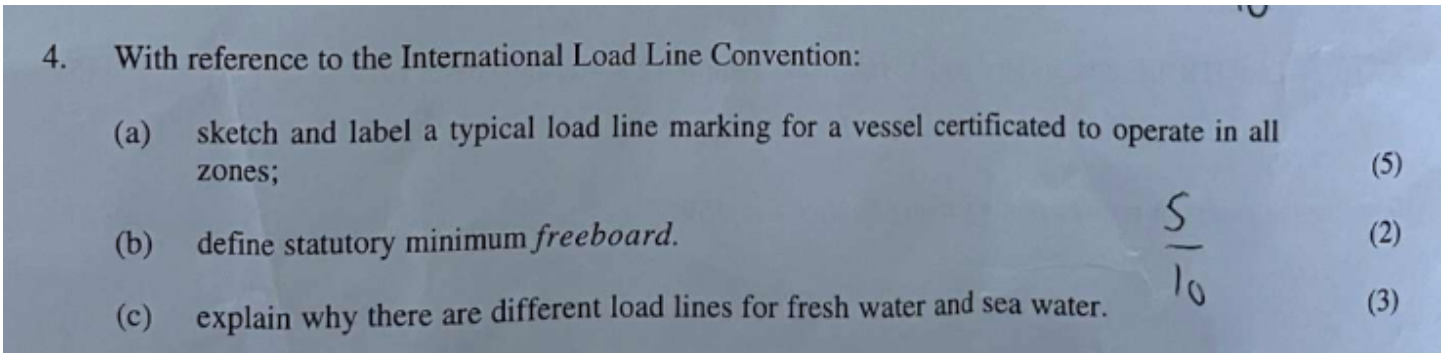
1. **Great Barrier Reef (Australia)**

2. **Wadden Sea (Netherlands, Germany, Denmark)**
3. **Galápagos Archipelago (Ecuador)**
4. **Western European Waters (France, Spain, Portugal, UK, etc.)**
5. **Florida Keys (USA)**

(Other correct answers could be: Torres Strait, Canary Islands, Baltic Sea, Bonifacio Strait, Papahānaumokuākea Marine National Monument, etc. — but only 5 needed.)

(b) Outline the general requirements for vessels transiting PSSA: (5 marks)

1. **Mandatory ship routeing** – vessels must use designated traffic separation schemes or recommended tracks.
2. **Discharge restrictions** – stricter MARPOL discharge requirements (oil, sewage, garbage, ballast water, etc.).
3. **Enhanced navigational warnings and reporting** – vessels may be required to report their movements and comply with monitoring systems.
4. **Prohibition of anchoring** – in ecologically sensitive zones where seabed damage may occur.
5. **Speed restrictions and manoeuvring limitations** – to reduce the risk of collision, grounding, or pollution.



4. With reference to the International Load Line Convention:

(a) sketch and label a typical load line marking for a vessel certificated to operate in all zones; (5)

(b) define statutory minimum *freeboard*. (2)

(c) explain why there are different load lines for fresh water and sea water. (3)

5/10

Q4

(a) Sketch and label a typical load line marking for a vessel certificated to operate in all zones (5 marks)

👉 The required sketch is the **Plimsoll Mark**, showing:

- **A circle with a horizontal line through the centre** (the Plimsoll line).
- **Deck line** marked on the ship's side.
- **Load line letters**: e.g. "LR" (Lloyd's Register) or classification society initials above the line.

- **Marks for zones**:
    - TF = Tropical Fresh Water
    - F = Fresh Water
    - T = Tropical
    - S = Summer
    - W = Winter
    - WNA = Winter North Atlantic

(b) Define statutory minimum *freeboard* (2 marks)

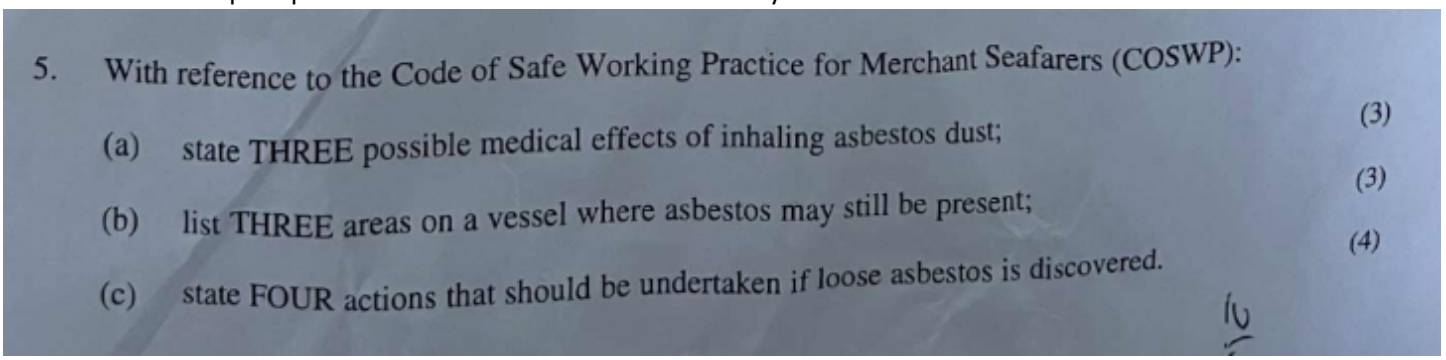
- **Freeboard** is the vertical distance from the **waterline** at the assigned load line (usually summer load line) to the **upper edge of the deck line** (freeboard deck).
- The **statutory minimum freeboard** is the minimum distance required by the Load Line Convention to ensure adequate reserve buoyancy and safety.

(c) Explain why there are different load lines for fresh water and sea water (3 marks)

1. **Density difference** – Fresh water is less dense than sea water, so the ship sinks deeper for the same displacement.
2. **Safety margin** – Different marks ensure the vessel maintains adequate **reserve buoyancy** in both fresh and saltwater.
3. **Operational flexibility** – Separate marks allow safe loading whether trading in rivers, lakes, estuaries (fresh water) or open ocean (sea water).

✅ **Answer Summary**:

- (a) Sketch: Plimsoll mark with TF, F, T, S, W, WNA zones.
- (b) Statutory minimum freeboard = vertical distance deck line → load line (minimum safety margin).
- (c) Different marks due to density differences between fresh and sea water, affecting buoyancy.



5. With reference to the Code of Safe Working Practice for Merchant Seafarers (COSWP):

(a) state THREE possible medical effects of inhaling asbestos dust; (3)

(b) list THREE areas on a vessel where asbestos may still be present; (3)

(c) state FOUR actions that should be undertaken if loose asbestos is discovered. (4)

Q5

(a) State THREE possible medical effects of inhaling asbestos dust (3 marks)

1. **Asbestosis** – chronic lung disease causing scarring and reduced lung function.
2. **Lung cancer** – significantly increased risk, especially among smokers.
3. **Mesothelioma** – an aggressive cancer of the lining of the lung (pleura) or abdomen (peritoneum).

(b) List THREE areas on a vessel where asbestos may still be present (3 marks)

1. **Lagging/insulation** on pipes and boilers.
2. **Gaskets and packing materials** in machinery or pipe joints.
3. **Fireproof bulkhead or deck insulation** and older electrical equipment.

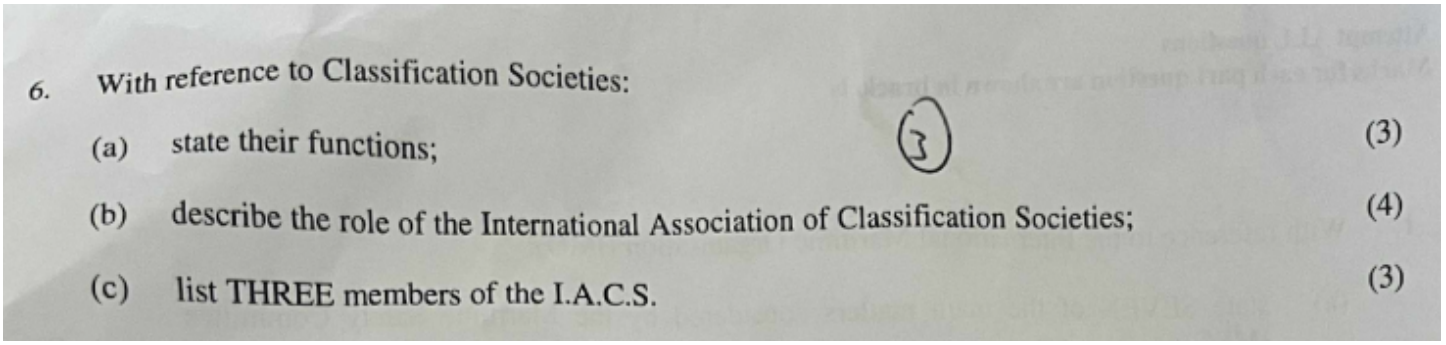
(c) State FOUR actions that should be undertaken if loose asbestos is discovered (4 marks)

1. **Stop work immediately** in the area and restrict access.
2. **Report the finding** to the Master or safety officer.
3. **Isolate the area** – post warning signs and prevent disturbance of material.
4. **Arrange for safe removal/disposal** by authorised personnel using approved protective equipment and procedures.

✅ **Answer Summary:**

- (a) Effects: Asbestosis, lung cancer, mesothelioma.
- (b) Locations: Pipe/boiler lagging, gaskets, fireproof insulation.

- (c) Actions: Stop work, report, isolate area, arrange safe removal.



6. With reference to Classification Societies:

(a) state their functions; (3) (3)

(b) describe the role of the International Association of Classification Societies; (4)

(c) list THREE members of the I.A.C.S. (3)

Q6

(a) State their functions (3 marks)

Classification Societies:

1. **Establish and apply rules/standards** for the design, construction, and maintenance of ships and offshore structures.

2. **Conduct surveys and inspections** during construction and throughout the vessel's life to verify compliance.

3. **Issue classification and statutory certificates** on behalf of flag states and international conventions (e.g., SOLAS, MARPOL).

(b) Describe the role of the International Association of Classification Societies (IACS) (4 marks)

- Provides a forum for cooperation between leading classification societies.

- Harmonises rules and standards across societies for uniformity and safety.

- Works closely with IMO and flag states to develop and implement maritime safety, security, and environmental regulations.

- Ensures consistent technical guidance and maintains high standards of ship safety and pollution prevention.

(c) List THREE members of the I.A.C.S. (3 marks)

Examples of members:

1. Lloyd's Register (LR) – UK.

2. Det Norske Veritas – Germanischer Lloyd (DNV-GL, now DNV) – Norway.

3. American Bureau of Shipping (ABS) – USA.

(Other possible: Bureau Veritas (BV), Nippon Kaiji Kyokai (ClassNK), Registro Italiano Navale (RINA)).

✅ **Answer Summary**:

- (a) Functions: Rules/standards, surveys, certification.
- (b) IACS role: Harmonisation, IMO cooperation, uniform safety/environment rules.
- (c) Members: LR, DNV, ABS (any three correct).

7. With reference to plant monitoring as part of a planned maintenance system: (10)

(a) list FIVE machinery faults that can be detected by means of vibration analysis; (5)

(b) outline TWO vibration parameters that are used for diagnostic work, stating the information EACH gives on the condition of the machine. (5)

Q7

(a) List FIVE machinery faults that can be detected by means of vibration analysis (5 marks)

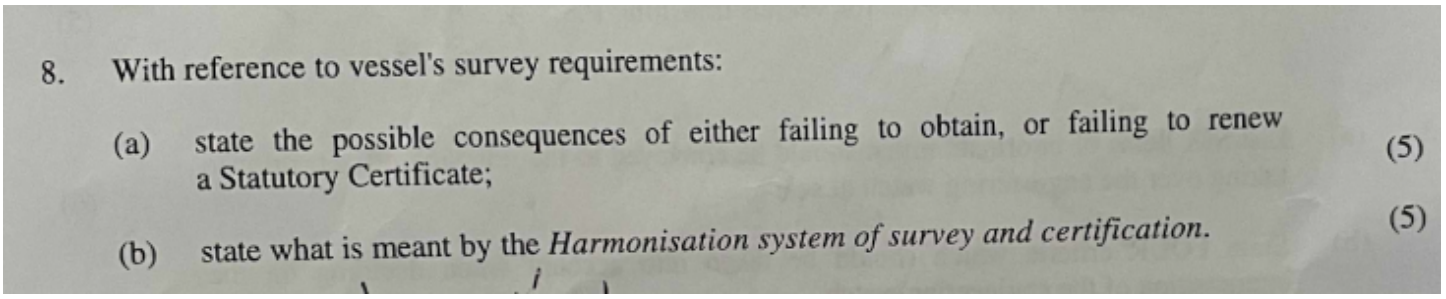
1. **Unbalance of rotating parts** – uneven mass distribution causing centrifugal forces.
2. **Misalignment** – shaft or coupling misalignment creating axial/radial vibration.
3. **Bearing defects** – wear, pitting, or brinelling leading to characteristic vibration frequencies.
4. **Gear faults** – tooth damage, wear, or backlash producing irregular vibration patterns.
5. **Looseness of components** – e.g., foundation bolts or worn fits causing rattling vibrations.

(Other possible answers: cavitation in pumps, resonance conditions, bent shafts.)

(b) Outline TWO vibration parameters used for diagnostic work, stating the information EACH gives (5 marks)

1. **Vibration amplitude (displacement, velocity, or acceleration)**
    - Indicates the **severity of vibration**.
    - High amplitude shows that the machine is under abnormal stress, possibly unbalance, looseness, or wear.

2. **Frequency spectrum analysis** (FFT – Fast Fourier Transform)
    - Identifies the **specific source of the fault** by linking vibration frequency to component speeds (e.g., shaft speed, gear mesh frequency, bearing fault frequencies).
    - Enables pinpointing whether the issue is unbalance, misalignment, or gear/bearing damage.



8. With reference to vessel's survey requirements:

(a) state the possible consequences of either failing to obtain, or failing to renew a Statutory Certificate; (5)

(b) state what is meant by the *Harmonisation system of survey and certification.* (5)

Q8

(a) State the possible consequences of either failing to obtain, or failing to renew, a Statutory Certificate (5 marks)

1. **Detention of the vessel** – Port State Control (PSC) or Flag State may prevent sailing until valid certificates are produced.
2. **Loss of insurance cover** – Hull and machinery / P&I clubs may refuse claims if certificates are invalid.
3. **Invalid trading status** – Vessel is considered unseaworthy and cannot legally operate internationally.
4. **Heavy fines or legal action** – Against the owner/operator for non-compliance with IMO/flag state regulations.
5. **Reputational damage and commercial consequences** – Cargo owners and charterers may avoid using uncertified vessels.

(b) State what is meant by the Harmonisation system of survey and certification (5 marks)

The **Harmonised System of Survey and Certification (HSSC)**, adopted by the IMO, means:

1. **Common survey intervals** – Aligns the renewal, intermediate, annual, and periodical surveys of different statutory certificates (e.g., Safety Construction, Load Line, MARPOL).
2. **Unified validity period** – Most major statutory certificates are valid for **5 years**, with intermediate/annual checks built in.
3. **Efficiency for shipowners** – Reduces the number of times a vessel must undergo separate surveys.
4. **Simplified administration** – Certificates are harmonised under SOLAS, MARPOL, Load Line, and other conventions.

5. **Global consistency** – Ensures that all vessels, regardless of flag, follow the same international survey standards.

9. (a) Describe the basic construction and operation of a Marine Travel Lift. (5)

(b) List THREE advantages and TWO disadvantages of a Marine Travel Lift. (5)

Q9

(a) Describe the basic construction and operation of a Marine Travel Lift (5 marks)

- **Construction**:
    1. Large **U-shaped, wheeled gantry crane** structure, wide enough to straddle a vessel.
    2. **Four upright columns** connected by top crossbeams for stability.
    3. Equipped with **multiple wheels/tyres** (often powered individually for manoeuvrability).
    4. **Slings or webbing straps** suspended from hoisting winches on the crossbeams.
    5. Hydraulic system for lifting and lowering, and steering system for precise positioning.
- **Operation**:
    1. The lift moves over the vessel, aligning slings beneath the hull (in the water).
    2. Slings are adjusted to take equal load distribution.
    3. Hydraulic winches lift the vessel vertically out of the water.
    4. The lift then carries the vessel inland for maintenance, storage, or repair.
    5. Reverse process to launch the vessel back into the water.

(b) List THREE advantages and TWO disadvantages of a Marine Travel Lift (5 marks)

- **Advantages**:
    1. Flexible — can handle a wide range of vessel sizes and shapes.
    2. Quick and efficient launching/hauling compared to dry docking.
    3. Portable — the lift can move vessels around the yard, not just lift them.
- **Disadvantages**:

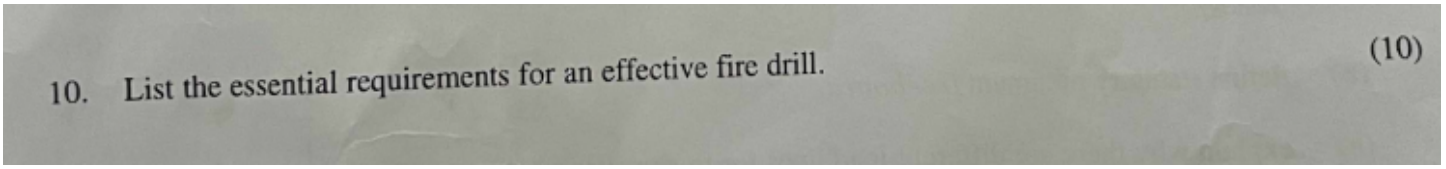
1. Limited lifting capacity compared to dry docks — generally only suitable for small to medium-sized vessels.

2. Requires large, flat ground area and strong quay/pier structures for safe operation.

✅ **Answer Summary**:

- (a) U-shaped gantry with wheels, hydraulic hoists, and webbing slings; operates by lifting vessels vertically and transporting them on land.

- (b) 3 Advantages: flexible, quick, portable. 2 Disadvantages: limited capacity, needs suitable ground/pier infrastructure.


10. List the essential requirements for an effective fire drill. (10)

Q10: List the essential requirements for an effective fire drill (10 marks)

1. **Alarm signal** – Sound the fire alarm so all crew recognise and respond to the signal.

2. **Muster of crew** – All personnel proceed to designated muster stations in good time.

3. **Role call and duties** – Check all crew are present and carrying out their assigned duties as per the muster list.

4. **Fire party response** – Fire teams should don appropriate firefighting clothing (fireman's outfit, breathing apparatus, helmets, gloves, boots).

5. **Use of equipment** – Demonstrate correct operation of fire hoses, nozzles, extinguishers, and fixed fire systems (CO_2, sprinklers, water mist, etc.).

6. **Communication** – Effective communication between bridge, engine room, and fire scene must be practised (using radios/phones).

7. **Boundary cooling & containment** – Simulate procedures for isolating the fire area, shutting down ventilation/dampers, and applying boundary cooling.

8. **Rescue operations** – Practice search and rescue for missing crew, using SCBA (Self-Contained Breathing Apparatus).

9. **Coordination with emergency services** – Where applicable, practice signals and procedures for contacting shore/port fire brigades.

10. **Debriefing and evaluation** – After the drill, conduct a review to identify weaknesses and ensure lessons are learned.

✅ **Answer Summary**:

- An effective fire drill must involve alarm raising, crew muster, assigned duties, use of equipment, communication, fire containment, rescue practice, and post-drill evaluation.