19 February 2021

1. Describe the procedure for using the local, emergency steering position, should the bridge control system become inoperative. (10)

19 February 2021

2. With reference to the MARPOL Convention Annex I - Shipboard Oil Pollution Emergency Plan (SOPEP):

   (a) outline FOUR minimum requirements that should be included in the plan; (4)

   (b) describe the actions that should be taken on discovering an accidental discharge of oil during bunkering. (6)

19 February 2021

3. As required by the STCW Convention:

   (a) state THREE actions that the Officer in charge of an Engineering Watch undertakes when assisting maintenance, repair or emergency activities; (6)

   (b) state TWO circumstances under which the Officer in charge of the Engineering Watch shall notify the Chief Engineer Officer without delay. (4)

19 February 2021

4. With reference to the International Load Line Convention (ILLC):

   (a) define *weathertight*; (2)

   (b) define *watertight*; (2)

   (c) state what a surveyor would check when inspecting a weathertight door; (2)

   (d) describe what *Freeing Ports* are, explaining why they are important. (4)

19 February 2021

5. With reference to the Code of Safe Working Practices for Merchant Seafarers guidance on *dangerous (enclosed) spaces*:

   (a) list FOUR examples of a dangerous (enclosed) space; (4)

   (b) outline the requirements to be satisfied before entering a dangerous (enclosed) space. (6)

19 February 2021

6. With reference to the classification of a vessel:

   (a) describe how the *continuous survey of machinery* may be applied, stating the time interval over which the surveys take place; (4)

   (b) list SIX types of machinery that would be inspected during a *continuous survey of machinery*. (6)

19 February 2021

7. With reference to a vessel having no previous record of machinery maintenance:

   (a) describe how a new planned maintenance system could be set up; (6)

   (b) list FOUR reasons for keeping records of all maintenance. (4)

19 February 2021

8. (a) Define the term *harmonisation system of survey and certification*. (4)

   (b) With reference to a vessel of 500 gross tonnes or more and carrying 12 passengers, list SIX statutory certificates that are required to be carried out in order to demonstrate compliance with the IMO Conventions. (6)

19 February 2021

9. (a) List FOUR factors that must be taken into consideration when determining the voyage requirements for a large motor yacht. (4)

(b) A vessel has a gross fuel capacity of 250 tonnes, 12% of which is unpumpable. The combined average sea power load of the vessel is 2700kW and the quoted specific fuel consumption, at this power load is 0.32kg/kWh.

Calculate the safe steaming range of the vessel at a speed of 15 knots. (6)

19 February 2021

10. (a) Write standing orders detailing the procedures to be followed in the event of a severe flooding incident within the machinery spaces. (6)

(b) List the positions of the four main watertight bulkheads on a typical vessel. (4)

19 February 2021

1. Describe the procedure for using the local, emergency steering position, should the bridge control system become inoperative. (10)

The procedure for using the local, emergency steering position in case of bridge control system failure will vary depending on the specific vessel design. However, here's a general outline of the steps involved:

1. Establish the Situation:

- **Confirm Bridge Control System Failure:** Verify that the primary steering control system on the bridge is indeed inoperable. This may involve checking alarms, indicators, and attempting basic maneuvering commands from the bridge.
- **Assess Steering Capabilities:** Briefly check if any alternative steering systems like autopilot are functional (if available and deemed safe as a temporary measure).

2. Notify Key Personnel:

- **Inform Master and Chief Engineer:** Immediately report the bridge control system failure to the Master of the vessel and the Chief Engineer. This facilitates coordinated action and ensures essential personnel are aware of the situation.
- **Alert Engine Room:** Communicate the situation to the engine room to ensure they are prepared to adjust engine output as needed during emergency steering with the local position.

3. Navigate to Local Steering Position:

- **Consult Emergency Procedures:** Refer to the ship's Emergency Response Procedures manual or placards for specific instructions on accessing and operating the local emergency steering position.
- **Proceed to Local Position:** Following the designated route, carefully navigate crew members to the local emergency steering position, which may be located in a steering gear room or other designated compartment onboard.

4. Prepare and Engage Local Steering:

- **Secure Local Gear:** Ensure the local steering gear is properly secured and prepared for operation according to the ship's instructions. This may involve removing locking pins or disengaging clutches from alternative steering arrangements.
- **Engage Local Steering:** Following the vessel's specific procedures, engage the local steering gear to establish manual control over the rudder.
- **Communicate with Engine Room:** Maintain clear communication with the engine room to coordinate steering commands with engine output adjustments for effective maneuvering.

5. Navigate with Local Steering:

- **Maintain Course:** Utilize the local emergency steering to maintain course and steer the vessel as needed under the direction of the Master.
- **Limited Maneuverability:** Be aware of reduced maneuverability with local steering compared to the primary bridge control system. Exercise caution during navigation and maneuvering operations.
- **Reduce Speed:** It may be prudent to reduce speed to enhance control of the vessel while operating with the local emergency steering system.

6. Rectify Bridge Control System Fault:

- **Technical Evaluation:** While navigating with the local steering system, efforts should be initiated to troubleshoot and rectify the bridge control system fault as soon as possible. This may involve the Chief Engineer and qualified crew members investigating the cause of the failure.
- **Repair or Isolate Fault:** If possible, isolate or repair the bridge control system fault to restore primary steering control from the bridge.

7. Transition Back to Bridge Control (if Repaired):

- **Verify System Functionality:** Once the bridge control system is repaired, thoroughly test its functionality before transitioning back from local emergency steering.
- **Resume Bridge Control:** Following successful testing and confirmation of normal operation, carefully transition steering control back to the bridge.

Important Notes:

- This is a general guideline, and the specific procedures may vary depending on the vessel type, emergency steering system design, and the ship's Safety Management System (SMS).

19 February 2021

2. With reference to the MARPOL Convention Annex I - Shipboard Oil Pollution Emergency Plan (SOPEP):

   (a) outline FOUR minimum requirements that should be included in the plan; (4)

   (b) describe the actions that should be taken on discovering an accidental discharge of oil during bunkering. (6)

(a) Four Minimum Requirements for SOPEP (MARPOL Annex I):

1. **Ship Information:** The SOPEP should include essential details about the vessel, such as its general arrangement, capacities of oil tanks, and location of oil discharge containment and recovery equipment onboard.
2. **Reporting Procedures:** The plan must outline clear procedures for reporting oil spills to the appropriate authorities, including coastal states, flag state administration, and the ship's company.
3. **Oil Spill Response:** This section details steps for containing and recovering spilled oil at sea. It should include deployment procedures for equipment like booms, skimmers, and sorbents.
4. **Crew Training:** The SOPEP should specify training requirements for crew members in responding to oil spills, including familiarization with the plan, equipment usage, and spill response procedures.

(b) Actions on Discovering Accidental Discharge During Bunkering:

1. **Stop Bunkering Immediately:** Stop the bunkering process to prevent further oil discharge by closing valves and isolating pipelines.
2. **Contain the Spill:** If possible, deploy containment booms around the spilled oil to minimize the contaminated area and facilitate recovery.
3. **Activate SOPEP:** Inform the master or designated officer and activate the SOPEP for a coordinated response involving trained crew members.
4. **Alert Authorities:** Report the incident to the relevant authorities as outlined in the SOPEP, typically contacting coastal state authorities, flag state administration, and the ship's company.
5. **Recover the Oil:** Deploy skimmers or other equipment to recover as much spilled oil as possible from the water surface.

6. **Record Keeping:** Document all actions taken, including the time of the spill, estimated amount of oil discharged, and response measures implemented, for future reporting and investigations.

Remember, the specific procedures may vary depending on the SOPEP and environmental conditions. Crew familiarization with the SOPEP and proper training on oil spill response equipment are crucial for an effective response.

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19 February 2021

3. As required by the STCW Convention:

(a) state THREE actions that the Officer in charge of an Engineering Watch undertakes when assisting maintenance, repair or emergency activities; (6)

(b) state TWO circumstances under which the Officer in charge of the Engineering Watch shall notify the Chief Engineer Officer without delay. (4)

STCW and the Officer In Charge of an Engineering Watch (OICEW)

(a) Actions of OICEW During Maintenance, Repair, or Emergencies (STCW):

The STCW Convention emphasizes the responsibilities of the Officer In Charge of an Engineering Watch (OICEW) during maintenance, repair, or emergency activities onboard a vessel. Here are three key actions an OICEW undertakes:

1. **Risk Assessment and Supervision:** The OICEW should participate in a risk assessment before any maintenance, repair, or emergency operation begins. This involves identifying potential hazards and ensuring appropriate safety precautions are implemented. They also supervise the work to ensure adherence to safe working practices and procedures.
2. **Communication and Coordination:** The OICEW plays a crucial role in communication and coordination during such activities. They must keep the Chief Engineer Officer informed of the ongoing work, any identified risks, and ensure clear communication between personnel involved.
3. **Monitoring and Watchkeeping:** While maintenance or repairs are ongoing, the OICEW maintains overall watchkeeping duties within the engine room. This includes monitoring critical machinery parameters, alarms, and ensuring the safe operation of remaining equipment.

(b) Circumstances for OICEW to Notify Chief Engineer Officer (STCW):

The OICEW is obligated to notify the Chief Engineer Officer without delay under two specific circumstances:

1. **Equipment Malfunction or Breakdown:** If the OICEW encounters a significant equipment malfunction or breakdown that could potentially affect the propulsion or safety of the vessel, immediate notification to the Chief Engineer is crucial. This allows for a prompt and coordinated response to address the issue and ensure the safe operation of the ship.
2. **Safety Concerns:** If the OICEW has any safety concerns regarding the ongoing maintenance, repair, or emergency activities, they must notify the Chief Engineer Officer without delay. This could involve concerns about inadequate safety precautions, the competence of personnel involved, or any other factor that could potentially compromise safety.

By fulfilling these responsibilities, the OICEW plays a vital role in ensuring safe and efficient machinery space operations during maintenance, repair, and emergency situations.

19 February 2021

4. With reference to the International Load Line Convention (ILLC):

(a) define *weathertight*; (2)

(b) define *watertight*; (2)

(c) state what a surveyor would check when inspecting a weathertight door; (2)

(d) describe what *Freeing Ports* are, explaining why they are important. (4)

Weathertight vs. Watertight and Freeing Ports in ILLC

The International Load Line Convention (ILLC) emphasizes the importance of weathertight and watertight closures to ensure a vessel's seaworthiness. Here's a breakdown of the terms and a vital feature related to these concepts:

(a) Weathertight:

In the context of the ILLC, weathertight refers to the ability of a structure or closure to resist the entry of wind, spray, and rain under normal sea conditions. Weathertight doors and hatches are essential for protecting exposed areas of a vessel from the elements and maintaining habitability for crew members.

(b) Watertight:

Watertight describes a structure or closure that is completely impenetrable to water. Watertight doors and hatches are critical for maintaining the integrity of watertight compartments onboard a vessel. These compartments are designed to remain flooded in case of breach, preventing progressive flooding and potential capsizing.

(c) Surveyor Inspection of a Weathertight Door:

During a Load Line survey, the inspector will carefully examine weathertight doors to ensure they can effectively resist weather elements. Here are some key aspects of a weathertight door inspection:

- **Door Seal Integrity:** The surveyor will check the condition of the door seal for any tears, deformations, or hardening that could compromise its sealing ability.
- **Door Closure Mechanism:** The inspector will verify the smooth operation of hinges and locking mechanisms. They will ensure the door can be closed firmly and secured tightly to prevent water ingress under pressure.
- **Weathertight Threshold:** The surveyor will check the door threshold for any gaps or damages that could allow water to seep in even when the door is closed.

(d) Freeing Ports and Importance:

Freeing ports are openings located in the bulwarks (side walls) of a vessel above the weather deck. They are essential for allowing water to drain from the weather deck while the vessel is underway. Here's why freeing ports are important:

- **Drainage of Deck Water:** When waves wash over the deck, freeing ports allow water to drain overboard and prevent accumulation on deck. This reduces the risk of flooding exposed areas and improves crew safety and working conditions.
- **Stability Enhancement:** Excessive water on deck can affect a vessel's stability. Freeing ports help maintain proper drainage and prevent the vessel from becoming top-heavy due to accumulated water.
- **Prevention of Ice Buildup:** In cold weather conditions, draining water through freeing ports prevents ice buildup on deck. Ice accumulation can increase weight and hamper movement around the deck, posing safety hazards.

By ensuring weathertight integrity of critical compartments and proper drainage through freeing ports, the ILLC promotes seaworthiness and prevents accidents at sea.

19 February 2021

5. With reference to the Code of Safe Working Practices for Merchant Seafarers guidance on *dangerous (enclosed) spaces*:

(a) list FOUR examples of a dangerous (enclosed) space; (4)

(b) outline the requirements to be satisfied before entering a dangerous (enclosed) space. (6)

Dangerous Enclosed Spaces and Entry Requirements (Code of Safe Working Practices)

The Code of Safe Working Practices for Merchant Seafarers provides important guidelines for working safely in enclosed spaces onboard ships. Here's a breakdown of key points:

(a) Four Examples of Dangerous Enclosed Spaces:

Enclosed spaces on a ship can pose various hazards due to limited ventilation, potential for oxygen deficiency, or the presence of flammable or toxic gases. Here are four prominent examples:

1. **Cargo Holds:** These compartments can contain residual fumes from cargo or pose oxygen deficiency risks if not properly ventilated before entry.
2. **Fuel Tanks:** The risk of flammable vapors and potential explosions makes fuel tanks particularly dangerous enclosed spaces.
3. **Pump Rooms:** These spaces may house pumps handling various liquids, creating a risk of exposure to toxic fumes or flammable vapors.
4. **Ballast Tanks:** Ballast tanks can contain stagnant water and oxygen-deficient atmospheres, posing a risk of suffocation.

(b) Requirements Before Entering a Dangerous Enclosed Space:

The Code emphasizes strict procedures to ensure crew safety before entering any dangerous enclosed space. Here are some key requirements that must be satisfied:

1. **Permit to Work System:** A formal permit to work system should be established. This ensures proper authorization, risk assessment, and implementation of safety precautions before entry.
2. **Ventilation:** The enclosed space must be adequately ventilated for a sufficient period to remove any hazardous gases or oxygen-deficient atmospheres.

3. **Atmosphere Testing:** Before entry, the atmosphere within the space must be tested for oxygen content, the presence of flammable or toxic gases, and any other potential hazards.
4. **Safety Equipment:** Crew entering the space must be equipped with appropriate personal protective equipment (PPE) such as breathing apparatus, safety harnesses, and communication devices.
5. **Standby and Rescue:** A designated standby person with rescue equipment should be stationed outside the enclosed space throughout the entry operation to assist in case of emergencies.
6. **Continuous Monitoring:** The atmosphere within the space and the well-being of personnel inside should be continuously monitored during the entire entry period.

By adhering to these requirements and following the Code of Safe Working Practices, crew members can significantly reduce the risks associated with working in dangerous enclosed spaces onboard ships.

19 February 2021

6. With reference to the classification of a vessel:

(a) describe how the *continuous survey of machinery* may be applied, stating the time interval over which the surveys take place; (4)

(b) list SIX types of machinery that would be inspected during a *continuous survey of machinery*. (6)

Continuous Survey of Machinery (CSM) for Vessels

(a) Applying Continuous Surveys:

The Continuous Survey of Machinery (CSM) is an alternative classification society survey scheme for vessels with propulsion machinery. It differs from traditional special survey approaches in its approach to inspections:

- **Phased Inspections:** Instead of a single extensive special survey every five years, CSM distributes required machinery inspections across a five-year cycle. In each annual audit, a specific portion of the machinery is surveyed by a classification society representative.
- **Time Interval:** The specific interval between inspections of individual machinery items depends on their criticality and potential risk of failure. Typically, around one-fifth of the machinery is surveyed each year.
- **Focus on Critical Equipment:** High-risk machinery components like main propulsion engines, auxiliary engines, boilers, and shafting systems are prioritized for more frequent inspections (e.g., annually).
- **Less Critical Equipment:** Lower-risk machinery like pumps, fans, and compressors may be surveyed less frequently (e.g., every two to five years).

(b) Machinery Inspected During Continuous Surveys:

Here are six types of machinery typically inspected during a continuous survey:

1. **Main Propulsion Engines:** These are the workhorses of the vessel, providing propulsive power. CSM focuses on engine integrity, lubrication systems, fuel injection equipment, and control systems.
2. **Auxiliary Engines:** These engines provide electrical power, drive pumps for various services, and may be used for emergency propulsion. Inspections cover engine condition, cooling systems, and control gear.
3. **Boilers:** Boilers generate steam used for propulsion (if applicable) or other purposes like cargo handling or heating. CSM surveys focus on boiler shell integrity, safety valves, and burner systems.

4. **Shafting and Propulsion Systems:** The propeller shaft transmits power from the engine to the propeller. CSM inspects shaft alignment, bearings, and seals for wear and misalignment.
5. **Steering Gear:** The steering gear controls the vessel's rudder for directional maneuvering. Inspections focus on hydraulic systems, ram cylinders, and control mechanisms.
6. **Auxiliaries and Pumps:** A vessel has numerous auxiliary pumps for various functions like bilge dewatering, firefighting, and cargo handling. CSM surveys pump condition, piping integrity, and valve operation.

This list is not exhaustive, and additional machinery specific to the vessel type may be included in the CSM program. The classification society and ship owner work together to develop a tailored CSM plan that ensures comprehensive machinery coverage within the five-year cycle.

19 February 2021

7. With reference to a vessel having no previous record of machinery maintenance:

(a) describe how a new planned maintenance system could be set up; (6)

(b) list FOUR reasons for keeping records of all maintenance. (4)

Setting Up a Planned Maintenance System for a Vessel with No Records

(a) Establishing a Planned Maintenance System (PMS):

Here's how to set up a new Planned Maintenance System (PMS) for a vessel with no previous maintenance records:

1. **Inventory and Data Collection:**
   - Conduct a thorough inventory of all machinery onboard the vessel, including engines, generators, pumps, navigational equipment, and auxiliary systems.
   - Gather any available manufacturer's recommendations for maintenance intervals and procedures for each piece of equipment. If manuals are unavailable, contact the manufacturer for guidance.
2. **Risk Assessment and Prioritization:**
   - Evaluate the criticality of each equipment item to vessel operation and safety. Prioritize maintenance tasks based on risk level. Critical equipment like main engines and steering gear will require more frequent attention than less critical systems.
3. **Develop Maintenance Schedules:**
   - Based on manufacturer recommendations, risk assessment, and industry best practices, develop maintenance schedules for each equipment item. These schedules should outline specific tasks to be performed at defined intervals (daily, weekly, monthly, yearly, etc.).
4. **Task Breakdown and Documentation:**
   - For each maintenance task, develop detailed procedures specifying the steps involved, tools required, and lubricants needed. Include safety precautions and acceptance criteria for completed tasks.
5. **Implementation and Monitoring:**
   - Implement the PMS by assigning maintenance tasks to qualified personnel. Ensure maintenance records are completed for every task performed, documenting findings and actions taken.

- Monitor the effectiveness of the PMS and adjust maintenance schedules or procedures as needed based on operational experience and equipment performance.

(b) Four Reasons for Keeping Maintenance Records:

Maintaining comprehensive maintenance records is essential for safe and efficient vessel operation. Here are four key reasons:

1. **Improved Maintenance Planning:** Detailed records of past maintenance work provide valuable insights for future planning. By analyzing trends in equipment performance and repair history, maintenance schedules can be optimized to prevent unexpected failures.
2. **Verification of Compliance:** Maintenance records serve as proof that the vessel is being maintained in accordance with regulatory requirements and classification society standards. This documentation is critical during port state control inspections.
3. **Troubleshooting and Fault Diagnosis:** When equipment malfunctions occur, maintenance records can facilitate troubleshooting and fault diagnosis. By reviewing past repairs and service history, engineers can pinpoint potential causes of problems more efficiently.
4. **Knowledge Transfer and Continuity:** Comprehensive maintenance records facilitate knowledge transfer between crew members. New crew can quickly understand the vessel's maintenance history and procedures, ensuring continuity of safe and effective equipment operation.

19 feb 2021

19 February 2021

8. (a) Define the term *harmonisation system of survey and certification.* (4)

(b) With reference to a vessel of 500 gross tonnes or more and carrying 12 passengers, list SIX statutory certificates that are required to be carried out in order to demonstrate compliance with the IMO Conventions. (6)

(a) Harmonised System of Survey and Certification (HSSC)

The Harmonised System of Survey and Certification (HSSC) is an international agreement that standardizes the process of surveying and certifying ships for compliance with various maritime safety and pollution prevention regulations. It aims to:

- **Streamline the survey process:** By harmonizing survey intervals and certificate validity periods, the HSSC reduces the administrative burden and cost for both ship owners and classification societies.
- **Improve efficiency:** Surveys can be coordinated more effectively, minimizing downtime for vessels.
- **Enhance safety:** Consistent standards ensure a high level of safety across the international shipping industry.

(b) Statutory Certificates for a Vessel of 500 GT with 12 Passengers

A vessel of 500 gross tonnage or more carrying 12 passengers is likely classified as a passenger ship and requires the following six statutory certificates to comply with IMO conventions:

1. **International Safety Management (ISM) Code Certificate:** Verifies the implementation of a safety management system onboard.

2. **International Load Line Certificate:** Confirms the vessel's safe loading limits based on its size, construction, and operational area.
3. **International Convention for the Safety of Life at Sea (SOLAS) Certificate:** Demonstrates compliance with SOLAS regulations regarding life-saving appliances, firefighting equipment, navigation, and communication systems. (This certificate is renewed annually for passenger ships under HSSC).
4. **International Maritime Organization (IMO) Pollution Prevention (MARPOL) Certificate:** Issued in modules depending on the type of pollution addressed (e.g., Annex I for Oil Pollution, Annex V for Garbage).
5. **International Tonnage Certificate (1969):** Provides the official gross and net tonnage of the ship.
6. **Passenger Ship Safety Certificate:** Confirms the vessel's compliance with SOLAS regulations specific to passenger safety, including life-saving appliances, muster stations, and emergency procedures.

Note: This is not an exhaustive list, and additional certificates may be required depending on the specific trade route, cargo carried, and other factors.

19 February 2021

9. (a) List FOUR factors that must be taken into consideration when determining the voyage requirements for a large motor yacht. (4)

(b) A vessel has a gross fuel capacity of 250 tonnes, 12% of which is unpumpable. The combined average sea power load of the vessel is 2700kW and the quoted specific fuel consumption, at this power load is 0.32kg/kWh.

Calculate the safe steaming range of the vessel at a speed of 15 knots. (6)

Large Motor Yacht Voyage Requirements and Steaming Range

(a) Four Factors for Determining Voyage Requirements:

Several factors influence the planning and execution of a safe and enjoyable voyage on a large motor yacht. Here are four crucial considerations:

1. **Destination and Route:** The distance to the destination, along with the intended route, significantly impacts fuel requirements, provision needs, and crew scheduling. Weather conditions along the planned route also need to be factored in.
2. **Number of People on Board (Crew and Guests):** The number of people onboard affects fresh water provisions, food supplies, and waste management considerations. It also influences accommodation arrangements and crew workload.
3. **Duration of the Voyage:** The length of the voyage determines the quantity of fuel, fresh water, and provisions needed. Longer voyages may necessitate re-supplying at ports en route.
4. **Fuel Capacity and Consumption Rate:** The yacht's fuel capacity limits its range without re-fueling. The vessel's fuel consumption rate at different cruising speeds needs to be considered to calculate safe steaming range and plan fuel stops.

(b) Safe Steaming Range Calculation:

We can calculate the safe steaming range of the vessel based on the provided information. Here's how:

1. **Calculate pumpable fuel:**

   Pumpable fuel capacity = Gross fuel capacity × (1 - Unpumpable fuel percentage) Pumpable fuel capacity = 250 tonnes × (1 - 0.12) Pumpable fuel capacity = 220 tonnes

2. **Convert pumpable fuel to kilograms:**

   Pumpable fuel (kg) = Pumpable fuel (tonnes) × 1000 kg/tonne Pumpable fuel = 220 tonnes × 1000 kg/tonne Pumpable fuel = 220,000 kg

3. **Important Note:** Calculating the exact safe steaming range is complex and depends on various factors beyond just fuel consumption, such as weather conditions, sea state, and vessel efficiency at different speeds. Here, we can estimate a theoretical maximum range based on the following assumptions:

   - All 220,000 kg of pumpable fuel are usable.
   - There are no inefficiencies in fuel consumption.

4. **Estimate daily fuel consumption:**

   We don't have information on daily operation hours, so we cannot calculate the exact daily fuel consumption. However, to estimate the steaming range, we can assume the vessel operates for 24 hours a day at 15 knots.

   Note: This assumption will overestimate fuel consumption, resulting in a more conservative estimate of the steaming range.

   Daily fuel consumption (kg/day) = Combined sea power load (kW) × Specific consumption (kg/kWh) × Operating hours (hours/day) Daily fuel consumption = 2700 kW × 0.32 kg/kWh × 24 hours/day Daily fuel consumption ≈ 20,736 kg/day (rounded to two decimal places)

5. **Estimate safe steaming range:**

   Safe steaming range (days) = Usable fuel (kg) / Daily fuel consumption (kg/day) Safe steaming range = 220,000 kg / 20,736 kg/day Safe steaming range ≈ 10.61 days (rounded to two decimal places)

Therefore, the safe steaming range of the vessel at a speed of 15 knots is approximately 10.61 days. This is a theoretical maximum, and the actual range may be lower in real-world conditions.

b 2021

19 February 2021

10. (a) Write standing orders detailing the procedures to be followed in the event of a severe flooding incident within the machinery spaces. (6)

(b) List the positions of the four main watertight bulkheads on a typical vessel. (4)

(a) Standing Orders: Severe Flooding in Machinery Spaces

WARNING: Evacuate all non-essential personnel and activate the watertight door alarms and the general emergency alarm immediately upon discovering severe flooding.

1. Evacuation and Alarm:

- If safe to do so, sound the general emergency alarm and **alert the bridge** of the flooding location and severity.
- **All non-essential personnel** must evacuate the machinery space and surrounding areas at risk.

2. Watertight Doors:

- **Close all watertight doors** in the vicinity of the flooding to prevent water ingress into other compartments.

3. Locating the Source:

- If safe and possible, identify the source of the flooding and attempt to isolate it. This may involve shutting off valves on leaking pipes or securing damaged equipment.

4. Fixed Firefighting Systems:

- If the flooding is accompanied by a fire, **do not** activate fixed fire suppression systems like CO2 flooding which could hinder access for repairs.

5. Bilge Pumps and Drainage Systems:

- **Activate all bilge pumps and drainage systems** in the affected machinery space to pump out floodwater.
- Monitor bilge pump operation and report any malfunctions to the bridge.

6. Damage Control Team:

- Prepare for the arrival of the damage control team by gathering information on the extent of flooding, location of the leak (if identified), and any operational hazards.

7. Muster Point:

- All evacuated personnel must assemble at the designated **muster station** and report to the muster officer.

8. Re-entry:

- Re-entry into the machinery space is **strictly prohibited** until authorized by the Chief Engineer or designated officer.
- Re-entry personnel must wear appropriate personal protective equipment (PPE) including waterproof clothing and footwear.

9. Incident Reporting:

- A detailed report of the flooding incident, including cause (if known), actions taken, and any injuries, must be submitted to the appropriate authorities.

(b) Positions of Four Main Watertight Bulkheads on a Typical Vessel:

1. **Collision Bulkhead:** Located at a distance from the fore perpendicular (bow) of the vessel, this bulkhead is the first barrier in case of a head-on collision.

2. **Machinery Space Bulkhead:** This bulkhead separates the machinery space (containing engines and boilers) from the rest of the vessel, preventing potential flooding in the machinery space from spreading to other compartments.
3. **Aft Peak Bulkhead:** This bulkhead is located at the vessel's stern (rear) and forms the boundary of the aft peak tank, a compartment that can be ballasted with water to trim the vessel.
4. **Bulkheads at Intervals:** Additional transverse watertight bulkheads are positioned throughout the vessel's length at specified intervals as determined by classification society regulations. These bulkheads further subdivide the vessel into smaller compartments, enhancing overall compartmentalization and damage control capabilities.