MCA Yacht 3/2 – Chief Engineer Statutory and Operational Requirements – Examination October 2006.

1. With reference to the Code of Safe Working Practices for Merchant Seamen guidance on the use of lifting plant:-
a) state FOUR safety requirements that need to be complied with before an item of lifting plant can be safely used; (4)
b) state the periodic inspection and testing requirements for an item of lifting plant; (4)
c) state where the results of inspections and testing are recorded. (2)

a) Four safety requirements that need to be complied with before an item of lifting plant can be safely used are:-

i) proof load tested and certified by a competent person;
ii) clearly marked with an identity number;
iii) clearly marked with its safe working load;
iv) operator is a competent person and certified to use the equipment.

b) The periodic inspection and testing requirements for an item of lifting plant are a thorough examination at least every six months for lifting gear and at least every twelve months for lifting appliances. A proof load test to be carried out on lifting appliances at least every five years. The examinations and tests are to be carried out by an experienced and suitably qualified competent person over 18 years old.

c) The results of inspections and testing are recorded in the vessel's 'chain register' and must be kept on board for a period of at least two years from the receipt of the certificates from the next following test or examination.

2. a) Define the term **flag state control.** (4)
b) Define the term **port state control.** (4)
c) State TWO examples of areas of the world that are covered by port state **memoranda of understanding (MOU).** (2)

a) The term flag state control refers to nations who have a mechanism for registering tonnage, called a registry. The maritime administration of such a nation is responsible for determining what regulations apply to vessels in its registry and for effecting inspection and certification of those vessels.

b) The term port state control refers to a vessel registered in one flag state visiting the waters of another flag state. The visiting vessel may be subject to inspection by representatives of that flag state, which then assumes the role as a port state.

c) Two examples of areas of the world that are covered by port state memoranda of understanding are:-

i) Paris MOU – all major European nations;

ii) Tokyo MOU – major Asian nations and those bordering the Pacific Ocean.

3. With reference to machinery planned maintenance:-
a) define the term **condition monitoring**; (4)
b) state THREE ways in which condition monitoring may be applied to a main propulsion diesel engine. (6)

a) The term condition monitoring refers to using various methods in order to obtain a trend analysis for the item of equipment to be used as a key to future maintenance needs.

b) Three ways in which condition monitoring may be applied to a main propulsion diesel engine are:-
   i) used lubricating oil analysis;
   ii) analysis of cylinder power outputs (indicator cards and maximum pressure measurements);
   iii) periodical calibration (for example, cylinder liners).

4. With reference to machinery watch-keeping procedures:-

a) state the off-duty time to which a watch-keeper is legally entitled for EACH of the following:-

i) in any twenty four hour period; (3)

ii) accumulatively over the period of one week; (1)

b) state the safety procedures that should be undertaken in EACH of the following circumstances:-

i) before entering an unattended machinery space; (2)

ii) whilst working within an unattended machinery space; (2)

iii) after leaving an unattended machinery space. (2)

a) i) 10 hours in any 24 hour period;

ii) 77 hours over a period of one week.

b) i) before entering an unattended machinery space, you should inform the officer of the deck/bridge watch by telephone to say that you are entering the machinery space;

ii) whilst working within an unattended machinery space, you should telephone the officer of the deck/bridge watch at regular intervals, say every 15 minutes;

iii) after leaving an unattended machinery space you should telephone the officer of the deck/bridge watch to say that you have left and the machinery space is unattended once again.

5. a) A vessel has no record of past fuel consumptions. Calculate the bunker requirements for a forthcoming voyage, given the following data:- (6)

Displacement	1500 tonnes
Range	2000 nautical miles
Speed	15 knots
Fuel coefficient	52,000

Note:- An appropriate fuel reserve allowance should be made.

b) State TWO actions that could be taken if it is found that, during the subsequent voyage, there is insufficient fuel remaining. (4)

a) Fuel consumption per day (tonnes) = displacement to the power 2/3 x speed cubed, all divided by the fuel coefficient.
Fuel consumption/day = cube root of 1500 squared x 15 cubed / 52000.
Fuel consumption per day = cube root of 2250000 x 3375 / 52000.
Fuel consumption per day = 131 x 3375 / 52000 = 8.5 tonnes

15 knots = 15 x 24 nm per day = 360 nm/day.
Voyage time = 2000 / 360 = 5.56 days.
Voyage fuel consumption = 5.56 x 8.5 = 47.2 tonnes.
Factoring in a 15% safe reserve, bunker requirement = 47.2 x 1.15 = 54.3 tonnes.

b) Two actions that could be taken if it is found during the subsequent voyage, there is insufficient fuel remaining are:-

i) to slow down the engine speed to a more economical fuel consumption;
ii) to plot a course to the nearest bunkering station.

6. With reference to the classification of vessels:-
a) list FOUR classification societies that are members of the International Association of Classification Societies; (4)
b) state what is meant by the term **condition of class**; (4)
c) state a typical time period over which a condition of class may be imposed. (2)

a) Four classification societies that are members of the IACS are:-
   i) Lloyds register of Shipping;
   ii) American Bureau of Shipping;
   iii) Det Norske Veritas;
   iv) Germanischer Lloyd.

b) The term condition of class is where a class surveyor considers that continuance of a ship in class should be dependent on certain requirements being fulfilled by the shipowner. The Surveyor will list these requirements on an Interim Certificate of Class as 'conditions of class now imposed'.

c) A typical time period over which a condition of class may be imposed would be to the next dry-docking of certain specified damage, if not too severe.

7. With reference to the International MARPOL Convention 73/78 Annex IV – Sewage Pollution (as amended August 2005):-

a) define the term **sewage**; (2)

b) state the limitations that are imposed on the discharge of sewage within 3 miles from land; (2)

c) state the THREE sewage handling options that will allow compliance with the convention. (6)

a) Sewage means drainage and other wastes from any form of toilets, urinals and WC scuppers. Also, drainage from medical premises (dispensary, sick bay, etc.) via wash basins, wash tubs and scuppers and drainage from spaces containing live animals.

b) The limitations imposed on the discharge of sewage within 3 miles of land is that the discharge from a sewage treatment plant or comminuted and disinfected sewage or raw sewage is prohibited.

c) The three sewage handling options that will allow compliance with the convention are:-

   i) a sewage treatment plant;
   ii) a sewage comminuting and disinfecting system;
   iii) a holding tank.

8. a) Using Worksheet Q8, sketch the changes in oxygen and hydrocarbon content of a flammable mixture, indicating EACH of the following:-

i) the point at which the mixture becomes inert; (2)

ii) the variation in the upper explosive limit of the mixture; (2)

iii) the variation in the lower explosive limit of the mixture. (2)

b) State FOUR examples of the use of **flame arrestors** on a vessel. (4)

a) page 252.

b) Four examples of the use of flame arrestors are:-

i) in fuel tank ventilation pipes to stop any outside flames entering the tank;

ii) in main starting air pipelines at the inlet to the individual cylinder starting air valves to stop any combustion flames from entering the main starting air line;

iii) on the crankcase side of crankcase relief valves to stop flames from the crankcase leaking out into the machinery space;

iv) in sewage tank ventilation pipes to stop any outside flames entering.

9. With reference to the watertight integrity of a vessel's hull:-

a) state FOUR reasons for fitting watertight bulkheads; (4)

b) state what is meant by EACH of the following terms:-

i) weather deck; (2)

ii) margin line; (2)

iii) permeability. (2)

a) Four reasons for fitting watertight bulkheads are:-

i) dividing the vessel into watertight compartments and thus restrict the volume of water that may enter if shell plating is damaged;

ii) reduce the rate of spread of fire;

iii) increase the transverse strength of the vessel;

iv) prevent undue distortion of the side shell and reduce racking considerably.

b) i) weather deck – uppermost deck of the vessel that is open to the weather;

ii) margin line – line drawn parallel to and not less than 3 inches below the upper surface of the bulkhead deck (freeboard deck) at the ship side;

iii) permeability – percentage of total volume of the compartment that can be occupied by water, that is, an empty compartment has a permeability of 100%.

10. With reference to the dry-docking of a large motor yacht:-
a) state FIVE services that must be made available in order to maintain the safety of the vessel; (5)
b) state FIVE essential checks that must be carried out prior to the flooding of the dock on completion of repairs. (5)

a) Five services that must be made available in order to maintain the safety of the vessel are:-

i) fire protection – water for vessel's fire main;
ii) shore electrical supply;
iii) shore communication;
iv) safe gangway access;
v) easy access to vessel's fire plan

b) Five essential checks that must be carried out prior to the flooding of the dock on completion of repairs are:-

i) all underwater fittings are checked to see that they are satisfactorily re-assembled;
ii) all double bottom tank drain plugs are checked to ensure they are replaced and properly tightened;
iii) forward and aft stern tube seals are checked to ensure that they are replaced and properly tightened;
iv) check that all hull repairs have been completed satisfactorily;
v) take soundings so that any adjustments to heel and trim required (due to modifications or flood water cleared, etc.) can be made.

WORKSHEET Q8