MCA Yacht 3/2 – Chief Engineer Statutory and Operational Requirements – Examination June 2007

1. a) Describe the format of a safety sign used to convey EACH of the following types of information:
   i) a prohibition; (2)
   ii) a hazard warning; (2)
   iii) a mandatory instruction; (2)
   iv) a safe condition or way; (2)
   b) State TWO examples of where such signs would be used on board a vessel. (2)

a) i) A prohibition sign consists of a red circle with a red diagonal bar on a white background with symbol;
ii) A hazard warning sign consists of a yellow triangle with a black border and symbol;
iii) a mandatory instruction consists of a blue disc with a white border and white symbol or words;
iv) a safe condition or way consists of a green square or rectangle with a white border and white symbol or words.

b) A no smoking prohibition notice would be posted at the top of the gangway when taking fuel bunkers on board. An emergency exit/escape route safe condition of way sign would be posted in the crew accommodation with an arrow showing the way to go to the nearest emergency exit.

2. The Maritime and Coastguard Agency (MCA) gives guidance to vessels by means of 'M' notices.
   a) State the THREE different types of 'M' notice, explaining the purpose of EACH type. (6)
   b) List FOUR examples of topics covered by current 'M' notices (4)

a) The three different types of 'M' notice are:-
   i) MSN (Merchant Shipping Notice) – this is used to convey mandatory information that must be complied with under UK legislation. These relate to Statutory Instruments and contain the technical detail of such regulations;
   ii) MGN (Marine Guidance Notice) – this gives significant advice and guidance relating to the improvement of the safety of shipping and of life at sea, and to prevent or minimize pollution from shipping;
   iii) MIN (Marine Information Notice) – this is intended for a more limited audience, for example training establishments and equipment manufacturers, or contain information that will only be of use for a short period of time, such as timetables for MCA examinations. They have a cancellation date, typically no more than twelve months after publication.

b) Four examples of topics covered by current 'M' notices are:
   i) MGN 156 M – Certificates of Competency or Marine Engine Operator Licenses for service as an Engineer Officer on commercially and privately operated yachts and sail training vessels;
   ii) MGN 231 M+F – Shipboard Oil Pollution Emergency Plan (SOPEP);
   iii) MSN 1401 M+F – Disinfection of Ship's Domestic Water;
   iv) MIN 292 M – Written Exam Dates 2007/2008 Engineer Officers Yachts and Sail Training Vessels.

3. A vessel has bunkered 300 tonnes of diesel fuel. Given that the average combined sea power load of the vessel is 3000 kW and with a stated specific consumption of 0.35 kg/kWh:
Calculate EACH of the following:
a) the daily fuel consumption of the vessel; (4)
b) the safe steaming range of the vessel at a speed of 18 knots. (6)

a) Specific consumption = 0.35 kg/kWh.
Therefore, at a power load of 3000 kW the vessel consumes 0.35 x 3000 kg/h = 1050 kg/h.
Therefore the daily fuel consumption = 1050 x 24 = 25,200 kgs = 25.2 tonnes.

b) Allowing for a 15% safety factor, the quantity of diesel fuel available = 300 x 0.85 = 255 tonnes.
As the daily consumption = 25.2 tonnes; 255 tonnes will be consumed in 255/25.2 days = 10.12 days.
As the average speed is 18 knots = 18 x 24 n.miles per day = 432 nm
Therefore, the safe steaming range = 10.12 x 432 = 4371.84 nm

4. With reference to a vessel's maintenance:
a) list FOUR reasons why it is desirable for the machinery of a large yacht to be covered by a planned maintenance system; (4)
b) state FOUR reasons why unscheduled maintenance may need to be performed; (4)
c) state ONE Example of acceptable unscheduled maintenance. (2)

a) Four reasons why it is desirable for the machinery of a large yacht to be covered by a planned maintenance system are:-
i) a greater plant availability with fewer breakdowns;
ii) more cost effective than sudden stop gap repairs;
iii) spare parts requirements known in advance and in stock;
iv) more effective labor utilization and, therefore, work load spread more evenly and better staff morale.

b) Four reasons why unscheduled maintenance may need to be performed are:-
i) badly manufactured components;
ii) poor materials;
iii) operating with poor quality fuel;
iv) operating outside of the design range of machinery

c) One example of acceptable unscheduled maintenance is:-
that technological advancement causes much equipment to become obsolete, consequently it is not designed to last, and when it fails it is out of date so may as well be replaced with modern equipment;

5. a) State SEVEN checks that should be carried out before taking over the machinery space watch from another officer. (7)
b) State the circumstances under which it would be inappropriate for the officer in charge of an engineering watch to hand over responsibility to a relief. (5)

a) Seven checks that should be carried out before taking over the machinery space watch from another officer are:-
i) levels in the bilges, slop tanks, fresh water tanks and any special disposal requirements;
ii) condition and level of fuel in the reserve tanks, settling tank, day tank and other fuel storage facilities;
iii) standing orders and special instructions of the chief engineer relating to the operation of the ship's systems and machinery;
iv)the nature of all work being performed on machinery and systems, the personnel involved and potential hazards;
v) condition and mode of operation of the various main and auxiliary systems, including the electrical power distribution system;
vi) the availability of fire fighting appliances;
vii) the state of completion of the engine room log book

b) The officer in charge of an engineering watch shall not hand over the watch to the relieving officer if there is reason to believe that the latter is obviously incapable of carrying out the watch-keeping duties effectively, in which case the chief engineer shall be notified. Examples would be, drunkenness or obvious illness (watery eyes, running nose, continuous sneezing, fever sweating).

6. With reference to the International MARPOL Convention 73/78 Annex IV – state the restrictions placed on the handling and disposal of sewage while a vessel is:
a) within twelve miles from land; (5)
b) within three miles from land. (5)

a) Within twelve miles from land, the discharge of sewage which has not been comminuted or disinfected is prohibited. This raw sewage has to be stored in a holding tank for discharge outside the twelve mile limit at a moderate rate when the vessel is en route and proceeding at not less than 4 knots.

b) Within three miles from land, the discharge from a sewage treatment plant or comminuted and disinfected sewage is prohibited. This effluent has to be stored in a holding tank and pumped ashore to a reception facility.

7. With reference to the classification of a vessel:
a) list SIX items that would be inspected during a **special hull survey;** (6)
b) describe how a **continuous hull survey** could be applied. (4)

a) Six items that would be inspected during a special hull survey are:-
i) rudder and, when required, lifted and the gudgeon pins re-bushed;
ii) anchors and chain cables;
iii) chain lockers, hawse pipes and chain stoppers;
iv)all openings in the shell including overboard discharges;
v) all decks and watertight bulkheads;
vi) all spaces, including holds, double bottoms, ballast tanks, etc

b) A continuous hull survey could be applied by opening up, inspecting and testing all hull compartments in rotation with a 5 year interval between examinations of each part. That is, 20% of the items are covered every year.

8. With reference to the periodical dry-docking of a vessel:
a) list FIVE services that should be made available in order to maintain the vessel while in the dock; (5)
b) list FIVE inspections/precautions that should be undertaken before re-flooding the dock. (5)

a) Five services that should be made available in order to maintain the vessel while in dock are:-
   i) Fire water via the vessel's international shore connection to the fire main and sprinkler systems;
   ii) Electrical supply; check that it is compatible with the ships phasing voltage and frequency;
   iii) Fresh water supply (if the crew are living on board) for washing and cooking purposes;
   iv) Refrigeration (if the crew are living on board); sometimes the chef arranges for frozen food to be sent ashore to cold storage or a self contained refrigerated container/s is/are supplied on the dock side;
   v) Sewage disposal; water supply for flushing toilets and connection for disposal of effluent.

b) Five inspections/precautions that should be undertaken before re-flooding the dock 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.

9. With reference to oxy/acetylene equipment:
a) state the dangers associated with the use of this equipment; (5)
b) state how the dangers listed in Q9(a) can be minimized. (5)

a) The dangers associated with the use of oxy-acetylene equipment are;-
i) acetylene is toxic and flammable;
ii) acetylene is liable to explode at a pressure above 15 psi;
iii) acetylene could flow back into the oxygen line;
iv) hoses can develop leaks;
v) oxygen and acetylene hoses could be interchanged.

b) The dangers listed above can be minimized by:-
i) making sure that the working area and storage area for the oxygen and acetylene bottles is well ventilated;
ii) fitting a safety valve which lifts at 15 psi;
iii) fitting non-return valves adjacent to the torch in the oxygen and acetylene supply lines;
iv) regularly visually inspecting hoses and using soapy water for leak testing;
v) ensuring that oxygen hoses and fittings have right hand threaded connections and acetylene hoses and fittings have left hand threaded connections.

10. With reference to the Code of Safe Working Practices for Merchant Seamen guidance on **enclosed spaces**:
a) list FOUR examples of an enclosed space; (4)
b) state SIX precautions to be undertaken before entering an enclosed space. (6)

a) Four examples of an enclosed space are:-
   i) tanks;
   ii) void spaces (cofferdams);
   iii) pipe passages (duct keels);
   iv) cargo hold.

b) Six precautions to be undertaken before entering an enclosed space are:-
   i) risk assessment made by a competent person (pre-entry checklist);
   ii) potential hazards identified;
   iii) space prepared and secured for entry, including ventilation;
   iv) atmosphere to be tested for oxygen content, toxic/flammable vapors, or gases;
   v) permit to work system to be used;
   vi) procedures, before and during entry to be established, for example communications, signals, timings, rescue procedure, etc.