ADVANCED HOTEL SERVICES April 2005

Attempt ALL questions

Marks for each question are shown in brackets

1. (a) State FOUR functions of an oil in a hydraulic system. (4)

   (b) Describe, with the aid of a sketch, the operation of a Pilot Operated Check Valve, suitable for use in a hydraulic system. (6)

2. Describe, with the aid of a sketch, the operation of a simple manual Hydraulic Telemotor Steering System, labelling the components. (10)

3. (a) Explain EACH of the following terms, when applied to a refrigerant:

   (i) superheated; (1)

   (ii) saturation temperature; (1)

   (iii) sub-cooled. (1)

   (b) Sketch a simple vapour compression system, showing EACH of the following:

   (i) the FOUR main components; (4)

   (ii) the position of the Superheated Gas phase; (1)

   (iii) the position of the Vapour or Saturated Gas phase; (1)

   (iv) the position of the liquid phase. (1)

4. Describe, with the aid of a sketch, the procedure for vapour charging a refrigeration plant. (10)

5. Describe, with the aid of a sketch, a compressed air system supplying air suitable for diving operations, from the discharge of the compressor to the charging manifold. (10)

6. (a) Sketch the electrical control circuit of a small free standing air-conditioning unit. (5)

   (b) Describe the operation of the circuit sketched in Q6(a), including the operation of the safety devices. (5)

7. Sketch a diagram of a Comfort Cooling Installation, using a return by-pass to control the humidity, labelling the components. (10)

8. With reference to *The International Maritime Organisation (IMO)* regulations for the Disposal of Sewage – *MARPOL 73/78 Annex IV*:

   (a) define EACH of the following:

   (i) sewage; (2)

   (ii) grey water; (2)

   (b) state the current regulations for the discharge of sewage. (6)

9. (a) State FOUR advantages of the *Reverse Osmosis* system over electrical heated and waste heat distillation systems. (4)

   (b) Sketch a two stage reverse osmosis plant. (6)

10. (a) State THREE types of micro-organisms that may exist in water. (3)

    (b) Describe, with the aid of a sketch, the operation of an Ultra-Violet Sterilizer. (7)

ADVANCED HOTEL SERVICES March 2005

Attempt ALL questions

Marks for each question are shown in brackets

1. (a) Explain why a hydrodynamic or a non-positive displacement pump should NOT be used in a hydraulic system to transmit pressure. (4)

   (b) Describe, with the aid of a sketch, the operation of a gear type pump. (6)

2. (a) Describe, with the aid of a sketch, the operation of a Spool Type Two Way Valve for use in a hydraulic system. (8)

   (b) Sketch the symbol for the valve described in Q2(a). (2)

3. (a) Sketch a thermostatically controlled expansion valve for a vapour compression refrigeration system. (5)

   (b) Describe the operation of the valve sketched in Q3(a). (5)

4. (a) State SEVEN desirable properties that are required for an ideal refrigerant. (7)

   (b) List THREE conditions in which a refrigerant can exist. (3)

5. Sketch a Biological Sewage Treatment Plant, identifying the treatment compartments and the direction of flow through the system. (10)

6. (a) Describe the precautions to be taken in the use and storage of Calcium Hyperchlorate. (6)

   (b) State FOUR physical properties that can be monitored to ensure an efficient and effective operation of a sewage treatment plant. (4)

7. (a) Describe, with the aid of a sketch, a pressurised Hot & Cold Fresh Water system. (6)

   (b) Explain the operation of the device for maintaining the operating pressure in the system sketched in Q7(a). (4)

March 2005

8. Describe, with the aid of a sketch, a system for chlorinating and conditioning drinking water. (10)

9. Describe an Oil Free air compressor, stating the purposes it can be used for. (10)

10. (a) Describe the contamination that can occur in the production of compressed air for use in diving equipment. (5)

    (b) List the routine maintenance to be undertaken to ensure the satisfactory service of Compressed Air Diving Equipment. (SCUBA) (5)

ADVANCED HOTEL SERVICES **January 2005**

Attempt ALL questions

Marks for each question are shown in brackets

1. (a) Explain the reason for the use of Duct Dampers in air conditioning systems. (3)

   (b) State TWO examples of Duct Dampers. (2)

   (c) Sketch ONE of the dampers stated in Q1(b). (5)

2. (a) Describe EACH of the following terms:

      (i) Wet Bulb Temperature; (2)

      (ii) Relative Humidity. (2)

   (b) State the counter measures that need to be taken to reduce the risks of Legionella in an Air Conditioning system. (6)

3. (a) Explain EACH of the following terms:

      (i) the Green House Effect; (3)

      (ii) ozone depletion. (3)

   (b) Describe the effect of *undercharge* in a refrigeration system. (4)

4. (a) State FIVE properties of a refrigeration oil. (5)

   (b) Describe the operation of an Oil Separator in a refrigeration system. (5)

5. (a) State the THREE main stages of a Biological Sewage Treatment Plant. (3)

(b) Describe the operation of a Biological Sewage Treatment Plant, explaining the process carried out in EACH of the stages stated in Q5(a). (7)

6. Describe, with the aid of a sketch, a simple Hydraulic Telemotor system. (10)

January 2005

7. (a) Sketch a Radial Piston Pump. (5)

(b) Describe the operation of the pump sketched in Q7 (a). (5)

8. (a) Sketch a Reverse Osmosis Plant, labelling ALL components. (6)

(b) Explain the operation of the plant sketched in Q8(a). (4)

9. With reference to Potable Fresh Water Tanks, explain EACH of the following:

(a) the tank cleaning process; (3)

(b) the steps taken to maintain system cleanliness; (3)

(c) the special Occasional Treatments. (4)

10. (a) Sketch a Chemical Filter tower supplying air suitable for breathing and diving, labelling ALL elements. (6)

(b) Explain the purpose of TWO of the filter elements sketched in Q10(a). (4)

ADVANCED HOTEL SERVICES **December 2004**

Attempt ALL questions

Marks for each question are shown in brackets

1. With reference to hydraulic systems:

   (a) state TWO functions of an accumulator; (2)

   (b) (i) describe, with the aid of a sketch, a gas charged diaphragm or bladder accumulator; (6)

   (ii) describe how the bladder is prevented from extruding in the accumulator described in Q1(b)(i). (2)

2. (a) State Pascal's Law of Hydraulics. (2)

   (b) State FOUR advantages of hydraulics over electrical systems. (8)

3. (a) Sketch a vapour compression refrigerant system, showing the FOUR main components. (4)

   (b) Describe EACH of the following terms when applied to refrigerants:

   (i) superheated; (2)

   (ii) saturation temperature; (2)

   (iii) sub-cooled. (2)

4. Describe, with the aid of a sketch, a Direct-Expansion Refrigeration System for an air cooler in an air conditioning installation. (10)

5. Describe, with the aid of a sketch, a Double Duct Air Conditioning System. (10)

6. Sketch a Zero Discharge sewage treatment system that re-cycles the flushing water, showing the flow through the system and labelling the MAIN components. (10)

7. (a) Describe, with the aid of a sketch, the operation of an automatic, pressure operated domestic fresh and drinking water system. (8)

(b) State the advantage of the system described in Q7(a). (2)

8. Describe, with the aid of a sketch, a Spirally Wound Cartridge Filter suitable for a Reverse Osmosis water making plant, identifying ALL component parts of the filter. (10)

9. (a) Explain the procedure for checking the clearance volume of a reciprocating air compressor. (6)

(b) State the effect on the performance of the compressor for EACH of the following:

(i) when the clearance is less than the manufacturer's recommended measurement; (2)

(ii) when the clearance is more than the manufacturer's recommended measurement. (2)

10. (a) State the reasons for the reduction in the work done, when air is compressed in multi-stages with intercooling between stages taking place. (6)

(b) Describe the effects of a suction valve of a reciprocating air compressor, not re-seating correctly. (4)

03-12

ADVANCED HOTEL SERVICES

Attempt ALL questions

Marks for each question are shown in brackets

1. (a) Describe the precautions to be taken in the production of compressed air for diving equipment. (5)

(b) List the routine maintenance to be undertaken, to ensure the safe operation of Compressed Air Diving Equipment (SCUBA). (5)

2. (a) Sketch a charging panel, from compressor outlet to cylinders, used in the production of compressed air of suitable purity for diving operations. (5)

(b) Describe the functions of the MAIN components sketched in Q2(a). (5)

3. With reference to air flow in Air Conditioning systems, explain EACH of the following terms:

(a) Diffusers; (3)

(b) Grilles; (4)

(c) Registers. (3)

4. (a) Sketch a Fire Damper that is operated by a *Fusible Link.* (5)

(b) Describe the operation and testing of the Fire Damper sketched in Q (4a). (5)

5. (a) Explain the importance of prevention of leaks from a refrigeration system. (4)

(b) Describe THREE methods employed when checking for leaks from a refrigeration system. (6)

6. (a) List FOUR safety devices fitted to a refrigeration system. (4)

(b) Describe the conditions that will cause TWO of the devices listed in Q6(a) to operate. (6)

03-12

7. Describe FIVE physical properties that can be monitored to ensure effective operation of a Biological Sewage Treatment Plant. (10)

8. Describe the precautions to be taken when using and storing *Calcium Hyperchlorate.* (10)

9. Describe, with the aid of a sketch, a Constant Pressure Hydraulic System to power a vessel's Windlass. (10)

10. (a) State THREE types of micro-organisms that exist in water. (3)

(b) Describe, with the aid of a sketch, the operation of an *Ultra-Violet Sterilizer.* (7)

10-03

ADVANCED HOTEL SERVICES

Attempt ALL questions

Marks for each question are shown in brackets

1. Outline FIVE types of food spoilage that can be prevented by refrigeration. (10)

2. Describe, with the aid of a sketch, the FOUR main components in a simple vapour compression cycle for a refrigeration system. (10)

3. Compare the advantages and disadvantages of the *single duct* AND the *2-duct* air-conditioning systems. (10)

4. Describe FIVE main components of an air conditioning *Central Unit*. (10)

5. Explain how an *Aerobic Sewage Treatment* plant operates. (10)

6. Describe, with the aid of a sketch, how a reduction of oil flow is achieved in a radial pump. (10)

7. Sketch EACH of the following hydraulic symbols, showing direction of flow where required:

   (a) check valve; (2)

   (b) manual shut off valve; (2)

03-03

4. *(a)* The hydraulic pump shown in Fig Q4, has a flow rate of 4.5 litres per minute, (4.5l/min). Calculate the time required for the hydraulic piston, of 100 mm diameter, to extend the piston rod 300 mm. **(6)**

   (b) Explain why the return stroke of the hydraulic piston in Q4(a), is quicker than the forward stroke. **(4)**

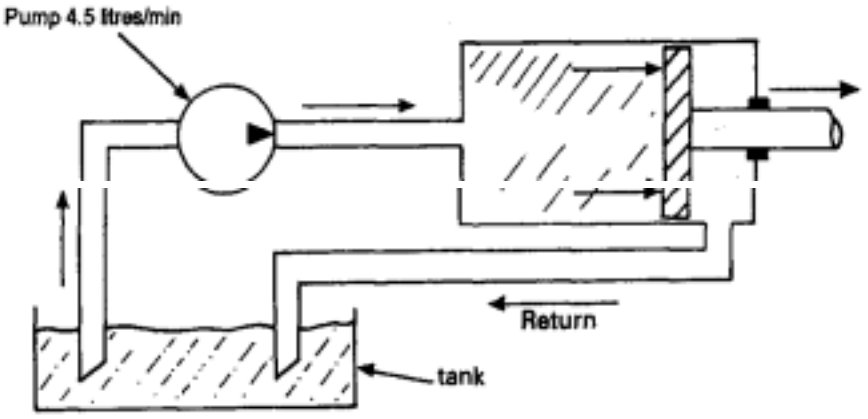

Fig Q4.

5. *(a)* Sketch a line diagram of a *potable* water hydrophore system, incorporating a continuous hot water circulating system. **(6)**

   (b) Describe how a drop in pressure actuates the fresh water pump. **(4)**

6. Outline FIVE factors that have an adverse effect upon the volumetric efficiency of an air compressor. **(10)**

7. Explain why it is necessary for air compressors, with interstage cooling, to have efficient drains fitted between each stage of compression. **(10)**

8. Describe the actions that should be taken to prevent the possibility of fumes from a sewage holding tank, finding their way back to a toilet. **(10)**

9. With reference to an air conditioning system, describe EACH of the following:

   (a) zone control; **(4)**

   (b) double duct; **(3)**

   (c) reheat system. **(3)**

10. Describe, with the aid of a sketch, a chlorinating and sterilisation plant for a drinking water system. **(10)**

01-03

ADVANCED HOTEL SERVICES

Attempt ALL questions

Marks for each question are shown in brackets

1. *(a)* Explain what is meant by EACH of the following:

   (i) Ozone Depletion Potential (ODP); **(3)**

   (ii) Global Warming Potential (GWP). **(3)**

   (b) State FOUR physical states that a refrigerant can be found to exist in. **(4)**

2. *(a)* Describe TWO acceptable methods of recovering refrigerant from a system. **(9)**

   (b) State the method that recovers the most refrigerant. **(1)**

3. Outline the heat gains that are required to be considered when evaluating the cooling loads for an air conditioning system. **(10)**

4. *(a)* Describe, with the aid of a sketch, a holding tank acceptable for vessels that are in port for a short period. **(5)**

   (b) Describe the problems that may arise from the retention of untreated waste in the system described in Q4(a). **(5)**

5. Describe the TWO types of air compressor water cooled intercoolers, stating the safety features fitted. **(10)**

6. Explain the term *Valve Loss* when applied to air compressor efficiency. **(10)**

7. *(a)* State THREE causes for excessive noise in a hydraulic pump. **(3)**

   (b) Describe the procedure to be taken to rectify ONE of the faults stated in Q7(a). **(7)**

8. Explain how a reduction in volume flow can be achieved in a radial hydraulic pump of the type shown in Fig Q8. **(10)**

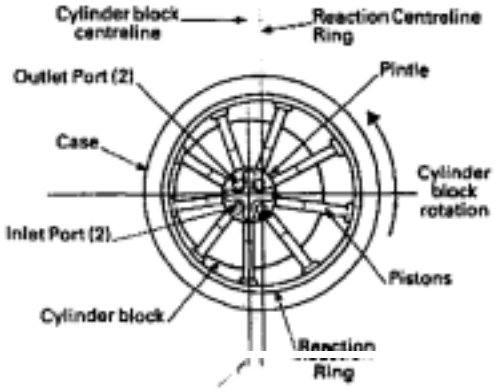

Fig Q8

9. Describe a reverse osmosis water generating plant. **(10)**

10. *(a)* State THREE systems of sterilization of fresh water for domestic purposes. **(3)**

(b) Describe, with the aid of a sketch, ONE of the systems stated in Q10(a) **(7)**

11-02

ADVANCED HOTEL SERVICES

Attempt ALL questions

Marks for each question are shown in brackets

1. Describe, with the aid of a sketch, a basic refrigeration system working on the *Vapour Compression Cycle.* (10)

2. *(a)* Sketch an unloading mechanism for a reciprocating refrigeration compressor cylinder, labelling the MAIN components. (6)

   (b) Describe the unloading mechanism sketched in Q2(a). (4)

3. Sketch a simplified diagram of a hydraulic governor, labelling the component parts. (10)

4. *(a)* State THREE properties that should be checked before an oil is used in a hydraulic system. (6)

   (b) State where the information in Q4(a) would be found. (4)

5. Describe, with the aid of a sketch, a direct expansion refrigeration system for use in a central air condition unit. (10)

6. *(a)* Describe the principle of *reverse osmosis* as used in the production of fresh water. (7)

   (b) Sketch a basic reverse osmosis system. (3)

7. List FIVE areas of an aerobic digestion process sewage treatment plant, which requires inspection at least every 12 months. (10)

8. State the safety parameters to be considered when personnel are engaged in maintenance work on sewage systems. (10)

9. State FIVE factors that reduce the efficiency of an air compressor. (10)

10. Describe the items to be checked during a crankcase inspection of a reciprocating air compressor. (10)

11-01

ADVANCED HOTEL SERVICES

Attempt ALL questions

Marks for each question are shown in brackets

1 List FIVE precautions which must be observed when handling refrigerants. (10)

2 With reference to automatic control devices fitted to vapour compression refrigeration units, describe EACH of the following:

(a) thermostatic expansion valve; (4)

(b) high pressure float valve; (4)

(c) capillary tube control. (2)

3 With reference to air conditioning systems:

(a) list FOUR locations in the system where Legionella may develop; (4)

(b) describe the measures that should be taken to prevent the development of Legionella. (6)

4 Describe, with the aid of a sketch, a double duct air conditioning system. (10)

5 Sketch a sewage treatment system that uses the aerobic digestion process. (10)

6 Describe, with the aid of a sketch, how the increase in the swash plate angle of an axial flow pump would alter the volume of oil delivered by the pump. (10)

7 Sketch the symbol for EACH of the following hydraulic components:

(a) pump-one way fixed displacement; (2)

(b) pump-one way variable displacement; (2)

(c) pump-reversible fixed displacement; (2)

(d) pump-reversible variable displacement; (2)

(e) motor-rotary fixed displacement. (2)

8 *(a)* Describe the inspections, operations and treatments required to ensure a safe domestic water supply after a lay-up period. (7)

(b) Describe the safeguards that should be taken to prevent possible contamination of tanks that are filled from a shore supply. (3)

11-01

9 *(a)* State the reasons for the reduction in the work done when air is compressed in stages and cooled between EACH stage of compression. (5)

(b) Explain the effects on the efficiency of a reciprocating air compressor if the suction valve does not close fully. (5)

10 State, with reasons, the precautions that should be taken when fitting new bearings to a reciprocating air compressor. (10)

10-01

ADVANCED HOTEL SERVICES

Attempt ALL questions

Marks for each question are shown in brackets

1 With reference to air conditioning systems:

(a) describe what is meant by the *comfort zone*; (4)

(b) describe how a psychrometric chart is used in determining if the air conditioning plant is performing to its maximum efficiency. (6)

2 With reference to compressed air breathing apparatus:

(a) describe the likely contamination that might be present when air is compressed for use; (5)

(b) outline the effect that the contaminants described in Q2 (a) will have if the air is subsequently used for breathing purposes. (5)

3 The use of refrigerant gases is controlled by International Protocol and United Kingdom legislation.

(a) Describe why it has been necessary to implement this degree of control over their use. (4)

(b) List THREE gases that fall within the controlled substance category. (3)

(c) Indicate which gases are being introduced as replacements to those listed in your answer to Q3 (b). (3)

4 With reference to a refrigerant charge in a refrigeration system, describe THREE methods that may be employed to detect the leakage of the refrigerant. (10)

5 Describe, with the aid of a sketch, the operation of a Vacuum Storage Sewage System. (10)

6 Sewage Treatment and Sewage Storage Plants present a number of hazards to personnel involved in maintenance.

Outline TEN hazards, stating the precautions that should be taken. (10)

7 Describe the *fail-safe devices* that might be included in a typical hydraulic system employed in the marine industry. (10)

8 A large yacht's potable water tanks and system are to be prepared for use after an extended period of lay up. Describe the preparation, treatment and tests required before bringing the tanks and system into use for domestic purposes. (10)

10-01

9 Sketch a 3-Stage, High Pressure, Air Compressor of the type that may be used for charging Diving Air Equipment, showing the Air-Flow. (10)

10 With reference to food storage at low temperature:

(a) list the FOUR most common spoilage agents; (4)

(b) discuss how the action of the agents listed in Q10 (a) can be retarded or eliminated in order to prevent disease. (6)