1. (a) State the purpose of fitting isolating valves in a ring fire main. To isolate a section of the ring from the main section in order to test and repair. (2)

(2)

(3)

(b) State the type of valve that should be fitted for isolating sections of a ring fire main. A Gate valve. (1)

(c) Explain why the type of valve stated in Q1(b) is used. Because it allows for full bore when open and is quick and easy to open and close in an event of emergency (2)

(d) State how it is ensured that the isolating valve will operate when required. It should be tested on a weekly basis

(e) State the position of the machinery space isolating valve. Normally its located in the pump room next to the fire pump on the discharge side of the pump

2. With reference to thermostatic three-way valves: (4)

(a) Describe how they operate; A 3 way valve has a cooper capsule filled with wax. When the wax expands from heat it forces down on the rubber sleave around the top of the piston forcing the piston down compressing the spring and rotating the valve plate. (3)

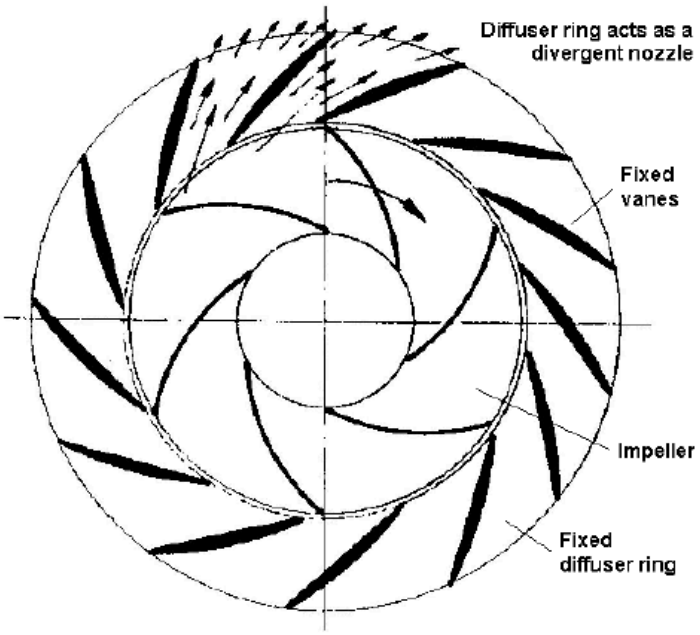
(3)

(b) Explain how they are tested;

(c) State THREE examples of their use in the systems of a diesel engine. On the coolant loop just before the expansion tank. On the jacket water loop before the exhaust system. On the oil loop of the engine.

3. (a) Describe, with the aid of sketches, the operating principles of a centrifugal pump fitted with a diffuser. (7)

(3)



Diffuser ring arrangement

- The vanes form a series of divergent nozzles that act to further convert the high velocity of the pumped fluid to pressure energy

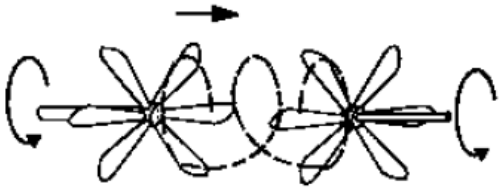
(b) Explain why it is considered good practice to start a centrifugal pump with discharge valve open.

- Most of these pumps are on induction motors that require 8-10 times the operating current on start up.
- To reduce load on the driving motor

4. With reference to hydraulic couplings for the main propulsion shaft:

(a) explain the <u>principle</u> of operation; (5)

(2)



(3)

Principle of the fluid clutch

- two impellors are immersed in a fluid
- the drive unit throws the oil outwards and then into the impellor of the driven unit
- Oil is then circulated back to the drive impeller

(b) state how the transmitted torque may be varied;

- the torque is varied by bleeding some of the fluid back to the suction side
- basically inducing slip

(c) state THREE advantages.

- No shock loading
- Over load will not affect prime mover
- Driven Machinery is not subjected to torsional vibrations

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

- Establish communications from the steering position to the bridge
- Establish a back up communication channel should primary system fail
- Change to emergency steering as per posted instructions
- If sea room permits, test/time emergency steering (60 seconds from 15 to 15 degrees)
- If necessary, setup watch keeping schedual

6. List FIVE advantages of a gear box being fitted to a main propulsion engine and explain why EACH may be considered to be an advantage.

- To achieve optimal propeller speed
- Can get reverse gear without changing engine rotation
- Start engine without load
- Can incorporate thrust bearing
- Can allow multiple engines to be connected to a single shaft

7. With reference to propellers, explain EACH of the following terms:

(a) skew; Blade Center Line is curvilinear sweeping back from the direction of rotation (2)

(2)

(b) rake; Propeller blade will slant forward or aft from the BCA (2)

(c) pitch; The linear distance that the propeller would move in one complete revolution through a solid medium not allowing for slip (4)

(d) slip. The difference between the theoretical distance the propeller should travel in one revolution and the actual distance the vessel travels

8. Sketch a shaft coupling of the flexible diaphragm type. (10)

9. State, with reasons, FIVE advantages of Valve Regulated Lead Acid Batteries. they Give give off very low hydrogen gas this making them alot safer than normal batteris, can be stored in any position.low maintenance. And stored in any compartment,The battery is stored closer to the unit,thus requiring smaller and less cable needed as to its closer location. (10)

10. With reference to AVRs:

(a) explain their purpose; (Atuomatic voltage regulator) It regulates the voltage and control it atuomaticly. (4)

(b) explain the effects that would be observes should an AVR give low output when the generator is: (2)

(4)

(c) running on its own; lights will dim,voltage will drop off lower and lower when loads are put on and off the generator. If it gets to low the under voltage breaker will trip.

(i)

(ii) running in parallel with a second generator whose AVR has no fault.The generator that has a good AVR will try to pick up the slack from the generator with the bad AVR. The good generator can trip on over current or over voltage or voltage in balance due to the bad generator not parreling equally.