

**MERCHANT MARINE ACADEMY OF MACEDONIA
SCHOOL OF ENGINEERS**

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FINAL EXAM

1. Fill in the gaps with a word from the list. There are two (2) extra words. (15 p.)

charge quills under temperature rate comply firing ingress fuel
solenoid clover boils starting suction sluggishness puncture cools

- If _____ in the manoeuvring gear is observed, you should ensure that the _____ pumps, rod connections and bearings are movable.
- The evaporator _____ the refrigerant back to a gas, at a very low _____.
- If the engine turns on _____ air but stops after receiving the order to run on fuel, the _____ valves may not be deaerated.
- _____ of water inside the liner should be avoided.
- Water in the fuel or in the _____ air can considerably increase the wear _____ of the liner.
- To _____ with the Tier II NO_x regulations, engine cylinders must operate _____ increased pressures and reduced temperatures.
- If one or more cylinders are not _____, you should check the _____ valve and the puncture valve in the fuel pump.
- _____ leafing takes place between each pair of lubricating _____ due to the sulphur contained in the fuel oil.

2. Complete the following sentences with an appropriate word. The first letter is given. (15 p.)

- The **b** _____ of a cylinder describes the inside diameter of the cylinder.
- When the engine runs unevenly and does not pick up rpm, the fuel **f** _____ may be blocked.
- **S** _____ is the process of supplying a diesel engine with air at a pressure greater than atmospheric.
- Cylinder liners are fabricated from a cast **i** _____ alloy.
- If the starting air valves in the cylinder **c** _____ are defective, you should **p** _____-test them for leakages.
- Onboard cylinder oil analysis tests the following two key parameters: iron content and **B** _____ Number.
- A reciprocating single or two-stage **c** _____ is commonly used to raise the pressure of the vapourised refrigerant.

-- Cylinder liner wear due to **f** _____ takes place between the sliding surfaces of cylinder liner and piston **r** _____.

3. You will read an article issued by Skuld, an international marine insurance company. Ten phrases have been extracted from it. Write the correct number in front of each phrase. (10 p.)

- of maintenance and overhauling instructions from the maker
- after the overhaul carried out by the ship's crew or shore
- as the crankshaft, main bearings, and others
- cleaned using continuous lube oil purifiers
- out regular crankcase inspections and crankshaft
- sent to a recommended lube oil laboratory
- major overhauling of the main engine
- other major components during normal operation
- tested for proper functionality and must be
- per the lube oil analysis reports

Skuld: Guidelines for mitigating main engine component failures and damage claims

Over the years, many incidents regarding damage to main engine components such ...[1]... happen. The main engine damage claims are one of the most expensive claims, Skuld highlights.

According to Dick Farrel Camoying, Assistant Vice President, Technical Manager, the cause is often down to poor lube oil quality, and as ...[2]... , it is often found that the lube oil has high levels of insolubles and the presence of contaminants.

'We also see damage to the crankshaft that may be attributed to an in-service material failure and which subsequently damages ...[3]... of the main engine. We have also seen in some cases that the engine maker's maintenance and operation guidelines are not being followed', Dick stated.

Skuld wants to highlight the importance of having all main engine maintenance and overhauling to be included in the PMS (Planned Maintenance System). There are cases we see where the damage happened shortly ...[4]... staff, and we therefore recommend that our members follow the maker's maintenance and operation instructions. The vessel should always have the latest versions ...[5]... available onboard.

Skuld's Loss Prevention department would like to advise its members as follows:

- Lubricating oil should be ...[6]... with the correct recommended temperature.
- Lube oil filters should be as clean as possible, and frequent routine cleaning as per PMS should be carried out.

- Samples of lubricating oil should be ...[7]... for analysis at least every three months or as per company PMS.
- Lube oil purifiers onboard should be ...[8]... operated as per manufacturers' instructions.
- It is recommended to carry ...[9]... deflection tests as per company PMS.
- It is recommended that during ...[10]... , a maker technician or specialist should be onboard.

(Retrieved: 17 February, 2024 from www.safety4sea.com)

4. Match the words from the list to their synonyms/definitions below. There is one (1) extra word. (5 p.)

alloy slow-steaming fabricate defective volatility

condense fouled perishable implement slipped dilute

- the property of changing readily from liquid to vapour/gas
- apply
- dirty
- change from gas to liquid (usually by cooling)
- manufacture
- lower fuel consumption during low-load operation
- mixture of metals
- faulty
- make a liquid thinner by adding water or other solvent
- possible to decay quickly

5. Complete the sentences with the appropriate form of the words in parentheses. (15 p.)

- As a general rule, a wear rate of 0.05mm/1,000 hours in liners is _____ **(accept)**.
- High sulphur _____ **(contain)** in the fuel can cause _____ **(extend)** damage to cylinder liners.
- Combustion _____ **(efficient)**, among other factors, can considerably affect _____ **(friction)** wear.
- The _____ **(dry)** ensures that the refrigeration system stays dry by removing any _____ **(moist)** from the refrigerant.
- The valve to starting air _____ **(distribute)** is closed.
- One way of monitoring the condition of the liner is checking its _____ **(oval)**.
- _____ **(adhere)** can result from poor or inadequate cylinder oil distribution around the liner surface.
- The _____ **(axis)** marks on the liner surface may result from _____ **(sufficient)** lubrication or excessive loading.
- Improper refrigeration can lead to _____ **(oxide)** of temperature sensitive cargo, _____ **(grow)** of micro-organisms, etc.

-- Micro-seizure often occurs during a running-in period and may not be _____ (destroy).

6. Fill in the gaps with a word from the list. There are two (2) extra words. (15 p.)

*corrosive lubricant moderately film cat carbon gauged cold sweep
sulphur abrasive scuffing lower micro-seizure highly hot wear*

-- Irregularities in the liner and piston rings coming into contact during operation are the cause of _____.

-- _____ wear is mainly caused by the presence of _____ in heavy fuel oil.

-- _____ wear is caused from splinters of piston rings, as well as ash and _____ fines which are contained in heavy fuel oils.

-- _____ testing is extremely important for an operator to fully understand cylinder _____ demands.

-- _____ occurs when there is a breakdown of cylinder oil _____ thickness.

-- _____ corrosion is found more in the _____ part of the liner, as the temperature of jacket water is too low.

-- For _____ corroded engines, a 100BN cylinder oil is recommended, whereas for _____ corroded ones, a 70BN cylinder oil should be sufficient.

-- Cylinder liners _____ in service and they should be _____ at regular intervals to find out the extent of damage.

7. Choose the correct answer. (15 p.)

- A diesel engine is supercharged in order to...
 - a. increase the no-load rpm
 - b. provide more fuel for combining with the air
 - c. lower the no-load rpm
 - d. provide more air for combining with the fuel

- A viscous type damper, as used on a marine diesel engine, is a device which dampens the torsional vibrations in the...
 - a. crankshaft
 - b. camshaft
 - c. flywheel
 - d. thrust shaft

- A piston is said to be at bottom dead centre when it is...
 - a. opening the exhaust ports
 - b. nearest to the cylinder head
 - c. farthest from the cylinder head
 - d. closing the fuel ports

- A diesel engine which is rated for normal operation at a crankshaft speed of 800 rpm is commonly classed as a ... engine.
 - a. slow-speed
 - b. constant-speed
 - c. high-speed
 - d. medium-speed

- A scored cylinder liner will cause...
 - a. combustion gases in the cooling water
 - b. rapid wear of piston rings
 - c. abnormally high cooling water temperature
 - d. high firing pressure

- Different ... valves in a refrigeration system provide automatic opening and closing of the liquid lines.
 - a. expansion
 - b. relief
 - c. solenoid
 - d. safety

- Diesel engine lube oil can become contaminated as a result of ...
 - a. the sulphur in the fuel
 - b. the water produced during combustion
 - c. unburned fuel oil
 - d. all of the above

- Combustion knock can occur in the cylinders of a diesel engine under any condition permitting ...
 - a. a lean fuel/air mixture
 - b. rapid vaporisation of injected fuel droplets
 - c. a shortened ignition delay period
 - d. excess fuel in the combustion chamber

- Vibrations from diesel engines and engine driven equipment are isolated from the hull structure by ...
 - a. flexible engine mountings
 - b. torsional vibration dampers
 - c. a detuner flywheel
 - d. harmonic balancers

- The ... valve is controlled by a thermostat to regulate the flow of the refrigerant from the H.P. side of the system to the L.P. side.
 - a. relief
 - b. expansion
 - c. throttle
 - d. solenoid

- If the analysis of used lube oil shows a high content of iron particles, this could indicate ...
 - a. inadequate air filtration
 - b. excessive cooling of lubricating oil
 - c. excessive ring and liner wear
 - d. corrosive deterioration of a bearing

- In a diesel engine, the pistons are attached to the crankshaft by ...
 - a. lash adjusters
 - b. piston guides
 - c. push rods
 - d. connecting rods

- The ... cools down the air in the cargo hold or room by transferring latent heat to the refrigerant.
 - a. compressor
 - b. cooler
 - c. evaporator
 - d. receiver

- “Loop”, “uniflow”, “cross flow” are terms used to describe various types of...
 - a. supercharging
 - b. turbochargers
 - c. scavenging
 - d. control air circuits

- Burning fuel with high sulphur content in a diesel engine will ...
 - a. produce corrosion in the cylinder and exhaust systems at low loads
 - b. cause clogging of the fuel system
 - c. increase the ability of the engine to start in cold weather
 - d. increase thermal efficiency

- Diesel engine lube oil diluted with diesel oil is indicated by...
 - a. decreased pour point
 - b. decreased viscosity
 - c. increased viscosity
 - d. increased flash point

- The ... is used to liquefy the refrigerant and to subcool it below the saturation temperature by circulating sea water, fresh water or air.
a. evaporator b. heater c. condenser d. compressor

- What occurs in the combustion chamber of a diesel engine cylinder, shortly after ignition and before the piston reaches TDC?
a. Rapid increase in volume and decrease in pressure.
b. Rapid increase in pressure and temperature.
c. Rapid increase in pressure with constant temperature.
d. Rapid increase in temperature with constant pressure.

- The ... serves to collect the cooled refrigerant, and is also used to drain out the refrigerant from the system for maintenance purposes.
a. drain tank b. sump tank c. receiver d. refrigerant tank

- Whether using a centrifuge or a simple filter, fuel cleaning and filtration will be the most effective when the fuel is at a ...
a. high temperature and low viscosity b. low temperature and high viscosity
c. high temperature and high viscosity d. low temperature and low viscosity

8. State whether the following sentences are True (T) or False (F). (10 p.)

- Dirty air is the main source of fuel injection system malfunctions.
- The ignition quality of diesel oil is indicated by the kinematic viscosity.
- A purifier can satisfactorily remove water from fuel oil.
- A disadvantage of a 4-stroke diesel engine over a 2-stroke one is greater weight per horsepower ratio.
- Temperatures above the dew point allow steam to condense.
- The possibility of damage from operating a diesel engine at critical speeds is reduced by the use of a vibration damper.
- Cylinder liner wear is normally the greatest in the middle of the cylinder.
- An electric drill is the best tool to use for removing the wear ridge at the top of the cylinder liner.
- Excessive cylinder liner wear can cause increased blow-by.
- Heavy residual fuel oils are heated prior to centrifuging in order to increase fuel viscosity.

good luck