

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

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FINAL EXAM

1. Complete the sentences with the appropriate form of the words in parentheses. (10 p.)

- Fuel is an important criterion for the choice of the engine, since more than 50% of the total running cost of the ship is due to fuel _____ (**consume**).
- Refined petroleum products, such as petrol, diesel, kerosene etc, are called _____ (**distil**) fuels.
- _____ (**sulphur**) acid can severely damage the engine parts it comes in contact with.
- Chemical _____ (**stable**) is an important specification of lube oils.
- HFO cannot be pressed through the injectors without _____ (**treat**).
- _____ (**add**) in the lubricating oil improve its quality.
- Wear _____ (**prevent**) are used to protect the engine parts from friction and _____ (**lose**) of metal material during boundary lubrication conditions.
- Discharge of gases or smoke is _____ (**emit**).
- _____ (**disperse**) are used to keep particles of soot and other contaminants suspended in the oil.

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

holder	fenders	atomisers	distilling	injection
crude	compression	drillings	mineral	lubricators
alongside	obtained	stem	filters	nozzle
fractional				insufficient

- A barge equipped with _____, hoses and pumps, brings the required product _____ the ship for off-loading.
- The process through which marine fuels are _____ at different points of the _____ tower according to their boiling temperatures is called _____ distillation.
- A fuel injector consists of three main parts: the injector _____, the needle with its _____ and return spring, and the _____ assembly which may have one or more _____ for spraying the fuel.
- The types of lube oils used in marine diesel engines are generally _____ oils, coming from the residues of _____ oil after its distillation.
- Incorrect _____ timing can cause lack of power, or can cause the engine to produce white smoke as there is _____ temperature to properly burn the fuel.
- From the service tank, the cylinder oil is supplied to _____ by gravity, and is led through _____ onto the liner surface.

3. Complete the sentences with an appropriate word. The first letter is given. (21 p.)

- The **p** _____ separates water and impurities from the fuel by means of centrifugal force.
- The procedure of continuously taking sample of the fuel delivered is called **d** _____ sampling.
- Marine **b** _____ is the supply of fuel oil for ships.
- The acronym CCAI stands for Calculated **C** _____ Aromaticity Index.
- The **m** _____ tank is used to collect the recirculated fuel oil.
- The last stage of the fuel oil **s** _____ is the injection of the fuel in the **c** _____ chamber.
- One of the objectives of lubrication is to **c** _____ the metal surfaces as lube oil can absorb a considerable amount of **h** _____.
- We should always consult the engine constructor's **m** _____ as to the recommended type of oil for the particular engine.
- **V** _____ is the most important property of lube oils.
- HFO is much cheaper than diesel oil, but it produces **s** _____ and dirtier exhaust gases.
- The oil is supplied to the engine at a **p** _____ of about 4 bar, and lubricates the main crankshaft **b** _____ first.

4. Match the words to their synonyms / definitions. There is one (1) extra word. (15 p.)

manifold	antifouling	insulate	erosion
scored	surplus	seizing	residue
fortified	tenacity	accumulate	fouled
precise	corrosion	bunker hose	stalling

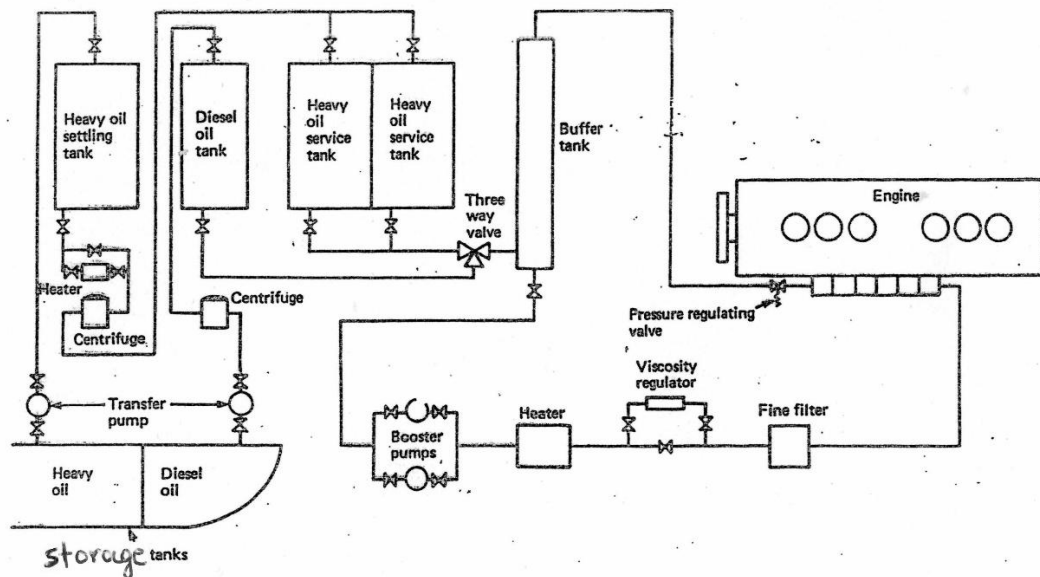
- with deep scratches: _____
- build up, gather: _____
- mechanical wear due to acids, rust: _____
- the fuel delivery connection: _____
- fighting dirt: _____
- accurate, exact: _____
- wrap up, protect against heat or cold: _____
- reduction of revolutions, eventual stopping of the engine: _____
- sticking property, adhesion: _____
- more than the amount that is needed, excess: _____
- what remains leftover: _____
- flexible tube designed to carry marine fuel: _____
- major damage due to insufficient lubrication: _____
- strengthened, reinforced: _____
- dirty: _____

5. State whether the following sentences are True (T) or False (F). (7 p.)

- The higher the viscosity of a fuel, the more heating is needed to reduce it.
- Heavy fuel oil is less viscous than diesel oil.
- The higher the CCAI, the later the ignition takes place.
- Carbon deposits can be formed in every part of the engine.
- The fuel resists to flowing when its viscosity is low.
- Around the flash point, the fuel can hardly be pumped and needs heating.

- Most fuel injectors are operated manually.
- The properties of lube oils are similar to those of fuel oils.
- The used fuel is mixed with a new charge in the settling tank.
- The viscosity index indicates how stable the oil is to variations of temperature.
- The cylinder oil service tank is bigger than the cylinder oil storage tank.
- In most fuel systems, the settling tanks and daily service tanks are also called gravity tanks.
- The bearings are lubricated by cylinder oil.
- After the fine filters, the lube oil passes through a heater before entering the engine.

6. Use the typical fuel oil system diagram and complete the missing term (or terms) in the text that follows. (12 p.)



From the _____ tanks, the HFO is pumped into the _____ tank, where water and heavy dirt sink down. Then it is fed through a heater to a _____ where the fuel is cleaned from all foreign particles. Water and dirt go to the sludge tank. Then the clean fuel is pumped into the HFO _____ tanks. From there the fuel, after passing through the _____ tank, is pumped by booster pumps into a _____ and right after into a _____, which automatically adjusts the temperature of the fuel. Finally, the fuel is discharged through a fine _____ to the main _____ fuel pump suctions. A _____ valve ensures a constant pressure supply to the engine-driven fuel pumps. A _____ tank is also installed in the system and a _____ valve allows us to change over from heavy fuel oil to diesel oil whenever the vessel is about to enter an ECA.

7. Circle the correct answer. (20 p.)

- --- indicates the ignition quality of diesel oil.
 - a. Carbon residue
 - b. CCAI
 - c. Cetane number
- --- shows the amount of heat given off on complete combustion of one pound of fuel.
 - a. Specific gravity
 - b. Temperature value
 - c. Heating value

- --- consists of hydrocarbon sludge and is contained in all fuels.
- a. Carbon residue b. Sediment c. Ash content
- A measure of the density or weight of the fuel is ---.
- a. density b. specific gravity c. kinematic viscosity
- --- is indicative of the ignition delay of residual fuels.
- a. CCAI b. Cetane number c. Flash point
- --- represents the incombustible metals present in the fuel.
- a. Ash content b. Acid number c. Carbon residue
- The word --- shows the quality of fuel and indicates how well a fuel will burn in the cylinders.
- a. class b. grade c. index
- The temperature at which the fuel vapours ignite when they are exposed to a flame is the ---
- It must be known for safe transport and storage.
- a. burning point b. flash point c. boiling point
- --- prevent the deterioration of oil due to high operating temperatures, and also due to the presence of water, metal particles and other impurities.
- a. Corrosion inhibitors b. Antifouling agents c. Anti-oxidants
- The ability of the oil to neutralise acidic compounds is represented by the --- value.
- a. TAN b. TBN c. BDN
- While in operation, the lube oil normally passes through mechanical --- to remove solid foreign particles.
- a. seals b. valves c. filters
- Corrosion --- reduce internal rust and corrosion on metal surfaces by forming a tenacious oil film on them.
- a. inhibitors b. depressants c. preventers
- --- partially prevent the lube oil from becoming less viscous as the temperature increases.
- a. Pour point improvers b. VI preventers c. VI improvers
- The crosshead and the guides are lubricated by ---.
- a. cylinder oil b. circulating lube oil c. turbine oil
- Pour point --- allow the lube oil to flow at cold operating temperatures.
- a. depressants b. dispersants c. improvers
- --- help to keep metal components clean.
- a. Antifouling agents b. Depressants c. Detergents
- The piston --- spread the cylinder oil up and down the liner surface.
- a. rods b. rings c. pins
- SAE 10 to SAE 20 oils are very --- and are unsuitable for diesel engines.
- a. viscous b. thin c. thick
- The acronym SAE stands for:
- a. Society of Automotive Engines
b. Society of Automotive Engineers
c. School of Automotive Engineers
- A --- indicator is used for monitoring filter contamination.
- a. pressure b. density c. differential pressure

