

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

**Course: Maritime English**

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**Exam paper grade:**

**Name:**

**Student number:**

**Date:**

**FINAL EXAM**

**A. Fill in the gaps using the words below. There are two extra words. (15 p.)**

*heavy density pour point energy overheated acid*

*calories overcooled sulphur liners flash point tank*

*separators residual carbon thermal temperature*

- Corrosion occurs mainly in engines burning \_\_\_\_\_ fuels, particularly with high \_\_\_\_\_ content.
- The \_\_\_\_\_ of a fuel oil determines the requirements for \_\_\_\_\_ heating and for the arrangement of fuel transfer piping.
- The dew point of sulphuric \_\_\_\_\_ should be avoided by making sure that fuel injectors, cylinder \_\_\_\_\_ and exhaust systems are not \_\_\_\_\_, although this could reduce the \_\_\_\_\_ efficiency of the engine.
- The \_\_\_\_\_ content of fuel is stated either in \_\_\_\_\_ or in British Thermal Units (BTUs) per unit weight.
- The \_\_\_\_\_ at which fuel oil vapours will ignite when exposed to a flame is the \_\_\_\_\_ and the minimum acceptable temperature for shipboard \_\_\_\_\_ fuels has been set to 60 degrees Celsius.
- Information concerning the \_\_\_\_\_ of fuel is very important for the operation of \_\_\_\_\_.

**B. Complete the sentences with the appropriate form of the words given. (15 p.)**

- Fuel efficiency and \_\_\_\_\_ (**environment**) friendliness are high on the list of requirements for ship \_\_\_\_\_ (**propel**) engines from today's shipping and shipbuilding industries.
- Wartsila aims to apply its \_\_\_\_\_ (**extend**) experience in dual-fuel power to 2-stroke engines.
- The systematic variation in \_\_\_\_\_ (**alkaline**) may produce uneven \_\_\_\_\_ (**corrode**) wear on the cylinder wall.
- \_\_\_\_\_ (**residue**) fuel oils as bunkered are not fit for use without proper cleaning to remove or reduce \_\_\_\_\_ (**contaminate**) that can be present in the fuels, such as water or \_\_\_\_\_ (**catalyst**) fines.

- Whatever the advantages of LNG as bunker fuel, \_\_\_\_\_ (**available**) of gas is seen as a key issue – if ships cannot bunker LNG where and when it is needed, there will be no incentive to take up this \_\_\_\_\_ (**opt**).
- As heavy fuel oil is more \_\_\_\_\_ (**viscosity**) than marine diesel oil, it cannot be pressed through the \_\_\_\_\_ (**inject**) without proper treatment.
- Owners and \_\_\_\_\_ (**operate**) are taking decisions now on how they will meet the financial and \_\_\_\_\_ (**comply**) challenges.
- Fuels which are produced on the basis of different crude oils tend to be \_\_\_\_\_ (**stability**) when mixed.

**C. Fill in the gaps using the words below. There are two extra words. (15 p.)**

*constituents trim particles wear high deflection crude low*

*cylinders mechanical crankshaft congeal flow abrasion*

*viscosity crankpins coolers*

- Apart from using the same point on the crankwebs for measuring \_\_\_\_\_, there are other factors which need to be kept in mind, such as load on the ship, \_\_\_\_\_, hog, sag, and so on.
- Water mist catchers are installed directly after the air \_\_\_\_\_ on all MAN B&W MC engines to prevent water droplets from being carried into the \_\_\_\_\_.
- Over a period of time, as the engine keeps running, the \_\_\_\_\_ in the bearings may not be uniform across the entire length of the \_\_\_\_\_.
- Although two fuel oils may have the same \_\_\_\_\_ figure, the lowest temperature at which they will \_\_\_\_\_ can be very different because it depends on the \_\_\_\_\_ of the fuel oils and the types of \_\_\_\_\_ oils from which they are refined.
- \_\_\_\_\_ may take place from the products of \_\_\_\_\_ wear, corrosion and combustion, all of which form hard \_\_\_\_\_.
- Some fuel oils tend to \_\_\_\_\_ and wax may appear from the solution when the temperature becomes too \_\_\_\_\_.

**D. Choose the correct option. (5 p.)**

- Hard particles which are caught between the upper horizontal ring/groove surfaces can cause \_\_\_\_.
- a. peeling                      b. punching                      c. pitting
- Abrasive cylinder wear can be caused by hard \_\_\_\_ which enter the cylinder via the fuel oil and/or air or it may be the result of scuffing.
- a. particles                      b. parts                      c. particulates
- The element which causes oxidation to the engine is \_\_\_\_.
- a. carbon                      b. silicon                      c. sulphur

-- For efficient removal of water by means of a conventional purifier, the correct choice of \_\_\_ disc is of paramount importance.

- a. weight                      b. volume                      c. gravity

-- The \_\_\_ the CCAI, the later the ignition takes place.

- a. higher                      b. lower                      c. clearer

-- LNG, as compared to HSFO, emits 99% less harmful \_\_\_ and provides a 20% reduction in greenhouse gases from the vessel stack.

- a. parts                      b. particulates                      c. particles

-- In actual practice crankshaft deflection readings should be taken at \_\_\_ different positions of the crankshaft.

- a. three                      b. five                      c. four

-- The acronym CFPP stands for :

- a. cold filter plugging point  
b. carbon filter plugging point  
c. cold filter petroleum point

-- As gas fuel enters the combustion space and mixes with the combustion air, there is a risk of uncontrolled combustion called \_\_\_.

- a. blowing                      b. knocking                      c. hitting

-- The acronym CCAI stands for:

- a. calculated calcium aromaticity indication  
b. cracked carbon aromaticity index  
c. calculated carbon aromaticity index

**E. Match the words to their definitions. There is one extra word. (10 p.)**

*degrade*      *implement*      *gauge*      *congeal*      *dismantle*

*ease off*      *neutralise*      *catalyst*      *insoluble*      *contaminate*      *tolerance*

-- a substance which, without itself changing, quickens chemical processes .....

-- solidify/clot .....

-- the permissible variation in some measurements or other characteristics of an object .....

-- make ineffective, with no result .....

-- make impure by mixing in dirty matter .....

-- a measuring instrument .....

-- take apart, disassemble .....

-- come/put into force .....

-- that cannot be dissolved .....

-- become or make less severe .....

**F. Match the terms concerning the marine fuel properties to their definitions/explanations. (15 p.)**

*lubricity    hydrogen sulphide    sulphur    cloud point    cetane index*

*used lubricating oils    heating value    oxidation stability    ash*

*density    kinematic viscosity    cat fines    water    total sediment aged    CCAI*

- It mainly affects fuel separation. It is used to convert volume to weight. \_\_\_\_\_
- The temperature at which wax begins to crystallise from a distillate fuel. \_\_\_\_\_
- The percentage of this in the fuel can be translated into a corresponding energy loss. It may also cause corrosion in the fuel system. \_\_\_\_\_
- The inherent ability of the fuel to protect some moving parts of fuel pumps and injectors from wear. \_\_\_\_\_
- Calcium, zinc and phosphorous are considered “fingerprint” elements of these. \_\_\_\_\_
- A measure of the tendency of a fuel to form sludge and acid products due to oxidation. \_\_\_\_\_
- They indicate the presence of tiny particles of aluminium and silicon used in the refining process and carried over into the residual fuel. \_\_\_\_\_
- A measure of the fluidity of a fuel at a certain temperature. \_\_\_\_\_
- An indication of the ignition quality of distillate fuels. \_\_\_\_\_
- The amount of heat given off on complete combustion of one pound of fuel: \_\_\_\_\_
- The amount of coagulated organic material that can be formed under normal storage conditions. \_\_\_\_\_
- It is indicative of the ignition delay of a residual fuel oil. \_\_\_\_\_
- It represents the incombustible metals present in a fuel. \_\_\_\_\_
- A highly toxic, flammable gas which can be fatal in extreme cases. \_\_\_\_\_
- Chemical element which can be very injurious to engine parts during combustion because it changes into acid: \_\_\_\_\_

**G. Match the words to their opposites. There is one extra word. (10 p.)**

*forbid    even    inflammable    loose    slow    simple*

*restricted    longitudinal    soft    lose    inadequate*

- unlimited .....
- allow .....
- complicated .....
- transverse .....
- sufficient .....
- rough .....
- incombustible .....
- rapid .....
- irregular .....
- tight .....

**H. Read the following article and answer the questions that follow. (15 p.)**

**ExxonMobil has issued fuel-switching tips for vessels entering and leaving ECAs**

ExxonMobil has compiled five ‘top tips’ to help vessel operators switch fuels effectively when entering and leaving emission control areas (ECAs) without introducing maintenance problems.

Typically, inadequate management of the fuel switch-over process can increase the risk of thermal shock to engine components, which can result in fuel pump seizures and engine shut-downs.

ExxonMobil advises marine operators to consider the following key tips:

- Have a clear switch-over procedure. It is important to ensure that the crew is familiar with the process. As an additional safety measure, the procedure should be tested prior to entering crowded and restricted channels where there is a higher risk of grounding or collision.
- Outline the best time to switch over. The optimal switch-over period is different for each vessel and operators must allow sufficient time for the fuel system to be flushed of all non-compliant fuel before arriving at an ECA limit.
- Avoid hazards; know the correct temperature and viscosity. The viscosity of heavy fuel oil (HFO), ECA fuels and marine gas oil (MGO) are very different. The appropriate temperature must be achieved to ensure that the optimum viscosity at the injectors is reached. HFO is injected at ~130°C and MGO needs to be cooled to ~30°C in order to reach the correct viscosity. Major engine manufacturers typically recommend a maximum temperature change of 2°C per minute to help avoid thermal shock.
- Understand compatibility. There is a risk of fuel incompatibility during the switching process where fuels may mix. This may clog filters, causing engine starvation and possible shut-down. In order to understand if fuels are compatible, an industry-standard spot test can be carried out on board or a more thorough compatibility test can be requested from a reputable testing laboratory.
- Choose the correct lubricant. Cylinder oils need to be sufficiently alkaline to neutralise any corrosive acidic sulphur in the fuel. However, when less sulphur is present, less sulphuric acid is produced. Too much alkalinity in the cylinder oil can lead to liner wear, while too little increases the risk of acid corrosion. When burning low sulphur fuels in slow speed engines, it is recommended that a lower base number (BN) lubricant be used.

(Retrieved: 23 June, 2016 from [www.mpropulsion.com](http://www.mpropulsion.com))

1. What problems can arise if the fuel switch-over process is not carried out adequately?

2. Why should the crew be familiar with the fuel switch-over process in relation to time and area?
3. Why should the crew know the correct temperature and viscosity of the different fuels?
4. What problems can be caused due to fuel incompatibility?
5. How can one check if fuels are compatible?
6. Why is it of paramount importance to choose the correct lubricant?

**GOOD LUCK!!!**