

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

**Course: Maritime English**

**Academic year: 2019 – 2020**

**Semester: ST (Retakes-old students)**

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**Name:**

**Student number:**

**Exam period: February 2020**

**Date: 17/02/2020**

**Exam paper grade:**

**FINAL EXAM**

**1. Fill in the gaps using the words below. (15 p.)**

*deflections wear acids centrifuging particles pour point boilers fines  
alignment abrasion sulphur low clarifiers effect transfer*

- Cylinder liner \_\_\_\_\_ is caused mainly by friction, \_\_\_\_\_ and corrosion.
- It is important to measure crankshaft \_\_\_\_\_ at regular intervals to ensure that the \_\_\_\_\_ of the shaft is within permissible limits.
- The presence of \_\_\_\_\_ in the fuel leads to the formation of sulphuric \_\_\_\_\_ which in turn lead to \_\_\_\_\_ temperature corrosion of the cylinder liners, exhaust systems and exhaust gas \_\_\_\_\_, unless special measures are taken to reduce their \_\_\_\_\_.
- The \_\_\_\_\_ of a fuel oil determines the requirements for tank heating and for the arrangement of fuel \_\_\_\_\_ piping.
- Improved \_\_\_\_\_ with automatic desludging provide adequate separation of water and \_\_\_\_\_ from the fuel, up to a density of 1010 kg/m<sup>3</sup> at 15° Celsius.
- Catalytic \_\_\_\_\_ give rise to abrasive wear and their content should be reduced as much as possible by \_\_\_\_\_ the fuel oil before it reaches the engine.

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

- \_\_\_\_\_ (**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.
- Although highly \_\_\_\_\_ (**viscosity**) fuels require proper preheating for the good operation of \_\_\_\_\_ (**centrifuge**) separators, and heating before injection for good \_\_\_\_\_ (**atomiser**), this characteristic can be handled without any problems.
- The systematic variation in \_\_\_\_\_ (**alkaline**) may produce uneven \_\_\_\_\_ (**corrode**) wear on the cylinder wall.
- 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**).

-- Operators must ensure that samples of fuel from each bunkering are \_\_\_\_\_ (**proper**) collected, labelled and retained on board so as to provide important \_\_\_\_\_ (**evident**) in the event of a dispute involving fuel quality.

-- Practical experience has shown that, due to \_\_\_\_\_ (**compatible**), certain fuel types may occasionally tend to be \_\_\_\_\_ (**stable**) when mixed. As a consequence, fuel mixing on board should be avoided to the widest possible \_\_\_\_\_ (**extent**).

**3. Fill in the gaps using the words below. (15 p.)**

*viscosity bent incompatible crankwebs refined overcooled*

*gauge degree sludge efficiency dew point fatigue*

*stratification constituents flow*

-- A mixture of \_\_\_\_\_ fuels may lead to \_\_\_\_\_ in the storage tanks and settling tanks, and also result in rather large amounts of \_\_\_\_\_ being taken out by the centrifuges.

-- Over a period of time, as the engine keeps running, the crankshaft will not remain in the initial straight line but it will get \_\_\_\_\_ either upwards or downwards to a slight \_\_\_\_\_ which may not be visible with the naked eye but could be sufficient to cause dangerous levels of \_\_\_\_\_ in the crankwebs.

-- 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 crude oils from which they are \_\_\_\_\_.

-- A dial \_\_\_\_\_ is inserted between the \_\_\_\_\_ to find out the distance between them.

-- The \_\_\_\_\_ of sulphuric acid should be avoided by making sure that fuel injectors, cylinder liners and exhaust systems are not \_\_\_\_\_, although this could reduce the thermal \_\_\_\_\_ of the engine.

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

-- 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

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

- a. three                      b. five                      c. four

-- 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

-- Hard particles which are caught between the upper horizontal ring/groove surfaces will 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

-- The acronym CCAI stands for:

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

-- 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 CFPP stands for :

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

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

*degrade*      *implement*      *gauge*      *melting point*      *dismantle*

*ease off*      *neutralise*      *catalyst*      *insoluble*      *cost-effective*      *tolerance*

- a substance which, without itself changing, quickens chemical processes .....
- the temperature at which a particular solid melts .....
- the permissible variation in some measurements or other characteristics of an object .....
- make ineffective, with no result .....
- bringing the best possible profits for the lowest possible cost .....
- a measuring instrument .....
- take apart, disassemble .....
- come/put into force .....
- that cannot be dissolved .....
- become or make less severe .....

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

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

*lubricity hydrogen sulphide sulphur cloud point cetane index*

*used lubricating oils heating value oxidation stability ash*

- 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. \_\_\_\_\_
- 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: \_\_\_\_\_
- They indicate the presence of tiny particles of aluminium and silicon used in the refining process and carried over into the residual 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. \_\_\_\_\_
- 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: \_\_\_\_\_

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

*forbid regular inflammable loose slow simple*

*unlimited transverse soft lose insufficient*

- restricted .....
- allow .....
- complicated .....
- longitudinal .....
- adequate .....
- rough .....
- incombustible .....
- rapid .....
- uneven .....
- tight .....

**8. 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!!!**