

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

**Course: Maritime English**  
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**Instructor: A. Birbili**  
**Name:**  
**Student number:**

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**FINAL EXAM**

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

*viscosity*   *bent*   *incompatible*   *liquefied*   *refined*   *manually*   *flow*  
*gaseous*   *degree*   *pour point*   *sludge*   *oil*   *vent*   *fatigue*  
*stratification*   *crankpins*   *constituents*

-- 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.

-- You should \_\_\_\_\_ the cylinder lubricating system by \_\_\_\_\_ pumping each individual pipe through until \_\_\_\_\_, without air bubbles, comes out from the union pipe/non-return valve.

-- 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 \_\_\_\_\_.

-- If you want to use gas at sea, there is a bit of a problem, because in a \_\_\_\_\_ state, your natural gas tank would need to be bigger than the vessel itself. So, you need \_\_\_\_\_ natural gas, which is cooled down to minus 163 degrees.

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

-- As heavy fuel oil is more \_\_\_\_\_ (**viscosity**) than marine diesel oil, it cannot be pressed through the injectors without proper \_\_\_\_\_ (**treat**).

-- The temperature rose to such an \_\_\_\_\_ (**extend**) that the firemen had to leave the burning ship.

-- Let me give you my \_\_\_\_\_ (**assure**) that the work will be finished by the agreed date.

- Fuels which are produced on the basis of different crude oils tend to be \_\_\_\_\_ (stability) when mixed.
- The dual-fuel \_\_\_\_\_ (opt) for gas-fuelled ships offers economic \_\_\_\_\_ (benefit) as well as practical \_\_\_\_\_ (environment) advantages.
- LNG could provide continuous \_\_\_\_\_ (comply) for a range of potential future legislation.
- The systematic variation in \_\_\_\_\_ (alkaline) may produce uneven \_\_\_\_\_ (corrode) wear on the cylinder wall.
- Marine fuel oils should be thoroughly cleaned to remove solid and liquid \_\_\_\_\_ (contaminate).
- The major \_\_\_\_\_ (differ) between the new sulphur \_\_\_\_\_ (emit) limits and previous \_\_\_\_\_ (regulate) is that they will apply to all ships, not just newer vessels.

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

*deflections wear control centrifuging equivalent pour point rough fines*  
*high alignment abrasion distillate flash point coat scratch*  
*transfer retrofitting*

- The gas supply system is a significant cost barrier to \_\_\_\_\_ any gas engine, as is the tank which is substantially bigger than the \_\_\_\_\_ fuel oil tank.
- 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.
- Vessels choosing to operate on \_\_\_\_\_ fuels within Emission \_\_\_\_\_ Areas (ECAs) could see fuel costs skyrocket.
- The \_\_\_\_\_ of a fuel oil determines the requirements for tank heating and for the arrangement of fuel \_\_\_\_\_ piping.
- 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.
- A \_\_\_\_\_ grindstone held in hand can be used to \_\_\_\_\_ over any marks on the cylinder liner.
- You should \_\_\_\_\_ the joint surfaces with permatex or a similar liquid sealing compound.

**D. When assessing the quality of a fuel, you must take into consideration a large number of standard properties that will determine its grade. Supply the term that matches the meaning of the following definitions/explanations of the most important parameters of fuel oils. (15 p.)**

- Unburned carbon during combustion which can deposit on engine parts: \_\_\_\_\_

- A measure of the density or weight of the fuel. It also serves as a rough check on viscosity, carbon content and other qualities: \_\_\_\_\_
- Content in water and solid particles. The higher it is, the more possible it is to cause erratic combustion and corrosion: \_\_\_\_\_
- Chemical element which can be very injurious to engine parts during combustion because it changes into acid: \_\_\_\_\_
- The lowest temperature at which the fuel oil is observed to flow: \_\_\_\_\_
- An indication of the ignition quality of the fuel: \_\_\_\_\_
- The amount of heat given off on complete combustion of one pound of fuel: \_\_\_\_\_
- Non-combustible solid material in the fuel which scratches the rubbing surfaces it comes in contact with: \_\_\_\_\_
- The temperature at which the fuel vapours ignite when exposed to a flame: \_\_\_\_\_
- The measure of the resistance of the fuel to movement. The higher it is, the more difficult it is for the fuel to flow: \_\_\_\_\_

**E. 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

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

*swarf*    *consequently*    *negligible*    *melting point*    *dismantle*

*grit*    *neutralise*    *catalyst*    *contaminate*    *optimise*    *congeal*

- solidify/clot .....  
-- take apart, disassemble .....  
-- as a result .....  
-- make ineffective, with no result .....  
-- make as perfect or as effective as possible .....  
-- too insignificant to be worth any attention .....  
-- make impure by mixing in dirty matter .....  
-- a substance which, without itself changing, quickens chemical processes .....  
-- the temperature at which a particular solid melts .....  
-- very small pieces of sand or stone .....

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

*forbid*    *regular*    *flammable*    *loose*    *slow*    *simple*

*unlimited*    *transverse*    *soft*    *lose*    *insufficient*

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

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

**GAS AS A FUEL**

One primary method for reducing emissions from a marine engine is to run on cleaner fuel. Operating with LNG fuel is an effective means of complying with current exhaust emissions legislation, since LNG is one of the few fuels pure enough to meet even the strictest regulations. In addition to enabling compliance with NOx and SOx abatement legislation, the emissions of particulate matter (PM) are minimised. Many

feel that this will prove to be the solution for future marine operations. Wärtsilä has led the way in developing technologies that make running on gas more available than ever, providing a range of solutions including the LNGPac<sup>TM</sup>, dual-fuel engines and Energopac, thus making natural gas increasingly viable as a propulsion fuel in marine applications. We offer the LNG fuel system on its own, as well as part of a complete propulsion system.

#### DUAL-FUEL ENGINES

Fuel flexibility gives owners and operators the chance to select the most suitable fuel depending on such factors as local environmental restrictions, fuel price variations, and fuel bunkering availability. Fuel flexibility also represents a safety feature of particular interest for marine applications. In the case of an interruption to the gas supply, dual-fuel (DF) engines automatically and instantly change to diesel operation without any loss in speed or power.

This feature ensures an additional level of operational safety, not present in a single-fuel installation. A unique feature of Wärtsilä dual-fuel engines is their ability to run on natural gas, marine diesel oil, heavy fuel oil and bio fuels, thus providing maximum flexibility in fuel choice.

In meeting the challenges set by stringent emission regulations another preferable method is switching the main source of power from liquid residual fuels to natural gas. When a DF engine runs in “gas mode” (natural gas as the primary source of energy), the following targets are achieved:

- CO<sub>2</sub> emissions are reduced by approximately 20%, thanks to a lower carbon content in natural gas compared to liquid fuels.
- NO<sub>x</sub> emissions are reduced by approximately 80%, thanks to the lean burn combustion process implemented in DF engines.
- SO<sub>x</sub> reduction are reduced by 99% thanks to the engines fuel properties.
- Particulates reduction by 95% due also to the engines fuel properties and the combustion efficiency process established.

(Retrieved: 04 June, 2015 from [www.wartsila.com](http://www.wartsila.com))

1. What are the advantages of running a marine engine on LNG fuel?
2. Which factors determine the selection of the most suitable fuel?
3. How do dual-fuel (DF) engines respond in case of an interruption to the gas supply?
4. What characteristic is unique to Wartsila dual-fuel engines?
5. How does a DF engine running in ‘gas mode’ affect the emissions of nitrogen oxides and carbon dioxide?

**GOOD LUCK!!!**