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

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

## FINAL EXAM

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

*viscosity* *bent* *incompatible* *liquefied* *refined* *manually* *flow*

*gaseous* *degree* *sludge* *oil* *vent* *fatigue* *stratification* *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.

**2. 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.

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

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

-- The gas supply system is a significant cost barrier to _____ any gas engine, and so 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.

**4. 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: _____

**5. 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

**6. 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 …….

**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.)**

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™, 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:

• $CO_2$ emissions are reduced by approximately 20%, thanks to a lower carbon content in natural gas compared to liquid fuels.

• NOx emissions are reduced by approximately 80%, thanks to the lean burn combustion process implemented in DF engines.

• SOx 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)

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!!!**