

**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

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

viscosity bent mixture liquefied refined pumping flow lubricating
gaseous crankshaft sludge oil fatigue storage constituents

- A _____ of incompatible fuels may lead to stratification in the _____ and settling tanks, and it may also result in large amounts of _____ being taken out by the centrifuges.
- Over a period of time, as the engine keeps running, the _____ will not remain in the initial straight line but it will get _____ either upwards or downwards to a slight degree which may not be visible with the naked eye but could be sufficient to cause dangerous levels of _____ in the crankwebs.
- You should vent the cylinder _____ system by manually _____ 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.)

- Fuel _____ (**efficient**) and environmental friendliness are high on the list of _____ (**require**) for ship propulsion 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 injectors without proper _____ (**treat**).
- Owners and operators are taking _____ (**decide**) now on how they will meet the _____ (**finance**) and compliance challenges.
- Fuels which are produced on the basis of different crude oils tend to be _____ (**stability**) when mixed.

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

deflections wear acids centrifuging particles pour point boilers

alignment friction sulphur low clarifiers effect heating abrasive

- Cylinder liner _____ is caused mainly by _____, abrasion 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 _____ and for the arrangement of fuel transfer piping.
- Improved _____ with automatic desludging provide adequate separation of water and _____ from the fuel, up to a density of 1010 kg/m³ at 15° Celsius.
- Catalytic fines give rise to _____ wear and their content should be reduced as much as possible by _____ the fuel oil before it reaches the engine.

4. Choose the correct option. (10 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 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

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. (10 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 NO_x and SO_x 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 LNGPacTM, 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:

- CO₂ emissions are reduced by approximately 20%, thanks to a lower carbon content in natural gas compared to liquid fuels.
- NO_x emissions are reduced by approximately 80%, thanks to the lean burn combustion process implemented in DF engines.
- SO_x 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!!!