

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

**Course: Maritime English**

**Academic year: 2018 – 2019**

**Exam period: June 2019**

**Semester: E'**

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**Student number:**

**Date: 27/06/2019**

**Exam paper grade:**

**FINAL EXAM**

**1. Complete the following text using the words in the list below. (15 p.)**

*excitation simulation solutions damper noise mountings firing mass*

*manufacturers distribution effective harmonic natural turbocharger structures*

The increasing demand for lowering the \_\_\_\_\_ and vibration levels of engines has forced \_\_\_\_\_ to make use of advanced analysis and \_\_\_\_\_ tools. In most cases, the practical means to reduce vibration is simply to detune the lowest \_\_\_\_\_ frequencies away from the main dynamic \_\_\_\_\_ frequencies. When detuning natural frequencies, the most \_\_\_\_\_ course is to concentrate on the heavy \_\_\_\_\_ built on to the engine and its \_\_\_\_\_. A good example is the \_\_\_\_\_, because its influence on the vibration system is very dominating due to its relatively large \_\_\_\_\_. Concerning the reduction of vibration on the Wartsila 9L46 engine, a study ended up with two different \_\_\_\_\_: for the current production engines, a new \_\_\_\_\_ order was introduced, offering a better \_\_\_\_\_ of the excitation forces at certain \_\_\_\_\_ orders. However, for engines already in the field, a tuned mass \_\_\_\_\_ was chosen as the most suitable solution.

**2. Complete the following sentences with an appropriate word. The first letter is given. (15 p.)**

-- **S** \_\_\_\_\_ is the process of removing exhaust gases from the engine cylinder after **c** \_\_\_\_\_.

-- **C** \_\_\_\_\_ is the filling of the cylinder with **f** \_\_\_\_\_ air.

-- The satisfactory removal of exhaust gases from the cylinder is very important because it affects the overall efficiency of the engine, the **p** \_\_\_\_\_ output and the fuel **c** \_\_\_\_\_.

-- Poor combustion, **l** \_\_\_\_\_ oil contamination, piston rings wear, as well as high mean **t** \_\_\_\_\_ in the cylinder are some of the problems resulting from incomplete scavenging.

-- Older engines were “naturally aspirated” – taking fresh air only at **a** \_\_\_\_\_ pressure.

-- The pressurised air supplied by the turbocharger is cooled to increase its **d** \_\_\_\_\_ before entering the cylinder.

**3. Complete the sentences with the correct form of the words in parentheses. (20 p.)**

- The lube oil should be checked regularly for water and \_\_\_\_\_ (**contaminate**).
- Vibration must not result in \_\_\_\_\_ (**annoy**) and \_\_\_\_\_ (**discomfort**) for the crew.
- Silicone is a highly \_\_\_\_\_ (**viscosity**) fluid.
- High levels of vibration may cause \_\_\_\_\_ (**form**) or \_\_\_\_\_ (**break**) of the engine components.
- Any accidents, such as \_\_\_\_\_ (**collide**) or \_\_\_\_\_ (**ground**), should be noted down in the logbook.
- As per MAN Diesel, noise \_\_\_\_\_ (**emit**) from 2-stroke engines can primarily originate from the turbocharger, exhaust valves or fuel oil \_\_\_\_\_ (**inject**) systems.
- Insulation techniques and the \_\_\_\_\_ (**prevent**) of local resonance are used to keep the vibrations in the accommodation and at other locations within \_\_\_\_\_ (**accept**) levels.
- Vibration analysis can be conducted by \_\_\_\_\_ (**maintain**) engineers, who use \_\_\_\_\_ (**rely**) methods that produce written data.
- Any prolonged \_\_\_\_\_ (**expose**) to noise levels of 85dB or above is likely to lead to hearing problems in the absence of ear \_\_\_\_\_ (**protect**). 140dB or above is likely to be physically \_\_\_\_\_ (**pain**).
- \_\_\_\_\_ (**satisfy**) scavenging depends on efficient \_\_\_\_\_ (**evacuate**) of exhaust gases and minimum \_\_\_\_\_ (**lose**) of fresh air through the exhaust passage.

**4. Match the following terms from physics and mechanics to their definitions. There is one extra term. (10 p.)**

*torsion      oscillation      natural frequency      vibration      damp*  
*amplitude      frequency      resonance      damper      velocity      detune*

- the speed of something in a particular direction:
- frequency at which a system oscillates when it is not subjected to a continuous or repeated external force:
- the greatest distance that a sound or radio wave vibrates:
- twisting, esp. of one end of something while the other end is held fixed:
- the sound or other vibration produced in an object by sound or vibrations of a similar frequency from another object:
- reduce the amplitude of a sound source:
- change the frequency (of an oscillatory system) away from a state of resonance:
- a continuous quick, slight shaking movement:
- the rate at which a sound (or electromagnetic wave) vibrates:
- movement back and forth in a regular rhythm:

**5. Match the words to make appropriate collocations. (5 p.)**

-- piston .....	conditions
-- working.....	tube
-- resilient.....	crankpin
-- stern.....	seizure
-- fatigue.....	operation
-- overheated.....	bearing
-- thrust.....	inspection
-- remaining.....	of machinery
-- PSC.....	on board
-- bunkering.....	mounting

**6. Complete the following sentences with an appropriate preposition. You can choose from the following: (15 p.)**

*above, with, up, in, at, by, through, from, to, on, within, out*

- Some 2-stroke engines are fitted ..... exhaust ports located just ..... the scavenge ports.
- The presence of water and dirty particles in the lube oil combined ..... severe vibrations may speed ..... the damage process.
- The following entries must be filled in the engine logbook:
  - the position of the ship ..... sea, ..... port or ..... anchorage.
  - speed of the ship ..... knots.
  - main engine rpm and load ..... the engine.
- In the engine room, sound reverberates and noise is emitted ..... other machinery, too. There are many noise transmission paths ..... which vibrational energy is transferred ..... one area ..... another.
- Vibration measurements should be carried ..... to assure that the vibration level is ..... ISO requirements.

**7. Match the following words to their synonyms. (5 p.)**

*deteriorate    aperture    feasible    tamper with    stiff*  
*reverberate    obligatory    track record    align    erratic*

- make changes to something without permission; interfere with:
- mandatory:
- able to be achieved:
- an account of everything that has happened so far:
- not regular, unpredictable:
- make worse:
- difficult or impossible to bend, rigid:
- arrange in a straight line:
- an opening, hole or gap:
- (of a sound) to be repeated several times:

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

*log oscillation pulses low hull near forward bracing*

*twisting exhaust spreads horizontal claims blower uniflow*

- 2-stroke engines with an \_\_\_\_\_ valve mounted in the cylinder head are known as \_\_\_\_\_ scavenged engines.
- Torsional vibration is a \_\_\_\_\_ phenomenon in the crankshaft which \_\_\_\_\_ from one end to the other due to uneven torque \_\_\_\_\_ coming from different pistons.
- The data from the \_\_\_\_\_ books is often used for insurance \_\_\_\_\_ in case of accidents, and \_\_\_\_\_ misses are discussed during safety meetings.
- Axial vibration can be defined as the \_\_\_\_\_ of the crankshaft in \_\_\_\_\_ and aft directions, parallel to the shaft \_\_\_\_\_ line.
- On 2-stroke engines, an electrically driven auxiliary \_\_\_\_\_ is usually installed because the air provided at \_\_\_\_\_ engine speeds is not enough.
- Engine \_\_\_\_\_, normally fitted on top of the engine, transmits the engine's rocking vibration to the \_\_\_\_\_ of the ship.

**GOOD LUCK!!!**