

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

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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!!!