

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

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**Name:**

**Student number:**

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**FINAL EXAM**

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

*Azipods propeller governor oil conformity addition thrust straight*

*regulations bearings load properties manoeuvrability unburnt speed*

-- As the \_\_\_\_\_ is used to lubricate the engine, its \_\_\_\_\_ deteriorate over a period of time due to the \_\_\_\_\_ of impurities which could include \_\_\_\_\_ fuel, water, acids, suspended particles and so forth.

-- Once the \_\_\_\_\_ of the engine has been set, the role of the \_\_\_\_\_ is to maintain that speed despite the variations in \_\_\_\_\_.

-- \_\_\_\_\_ are used to support the shafting in a \_\_\_\_\_ line between the main engine and the \_\_\_\_\_.

-- A marine diesel engine has to be maintained in \_\_\_\_\_ with the various international rules and \_\_\_\_\_ as well as the advice of the manufacturer.

-- \_\_\_\_\_ are the most advanced option when \_\_\_\_\_ is really valuable to the vessel since these systems can turn 360 degrees and \_\_\_\_\_ can be directed at any direction.

**2. Choose the correct alternative of the words in italics. (15 p.)**

It is a bit difficult to read the early signs of a crankcase explosion. This is because the indications are *similar / different* to many other emergency situations. But there are few pre-explosion signs that can be read. Crankcase explosion will lead to:

- Sudden increase in the *inlet / exhaust* temperature
- Sudden *increase / decrease* in the load of the engine
- *Regular / irregular* running of the engine
- Incongruous noise of the engine
- Smell of the white mist.

In case of these indications, engine *load / speed* should be brought down immediately and the supply of fuel and air should be stopped. The system should then be allowed to cool down by *opening / closing* the indicator cocks and turning on the internal cooling system.

Crankcase explosions can be prevented by avoiding the generation of hot spots. They can also be prevented in the following ways:

- By providing proper lubrication to the reciprocating parts, thus avoiding high *temperatures / pressures*.
- By avoiding overloading of the engine
- By using bearings with *black / white* metal material which prevents rise in temperature.
- By using oil mist detector in the crankcase with proper *vision / visual* and audible alarm. Oil mist detectors raise an alarm if the *concentration / condensation* of oil mist rises above the permissible limit.
- Pressure *regulating / relief* valves should be fixed on the crankcase for the instant release of pressure. They should be periodically *temperature / pressure* tested.
- Crankcase doors should be made of strong and durable material. Vent *pipes / ports* shouldn't be too large and should be checked for any choke up.
- In the event of an explosion, the crankcase doors should never be opened until the system has totally *calmed / cooled* down.
- Fire extinguishing medium should be kept standby. In many systems, *exhaust / inert* gas flooding system is directly connected to the crankcase.

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

*cavitation drain running detector flames principle vent solution*

*blade explosion fresh crankcase relief warning pressure*

-- In freezing weather, you must carefully \_\_\_\_\_ all passages and pockets in the engine that contain \_\_\_\_\_ water and are subject to freezing, unless an antifreeze \_\_\_\_\_ has been added to the water.

-- \_\_\_\_\_ is the formation and bursting of vapour bubbles in water near a moving propeller \_\_\_\_\_ in regions of low pressure due to Bernoulli's \_\_\_\_\_.

-- The oil mist \_\_\_\_\_ does not reduce or prevent the formation of mist, but it only gives \_\_\_\_\_ in case the concentration rises above the level at which an \_\_\_\_\_ can take place.

-- When engines are stopped, you must \_\_\_\_\_ all starting-air lines because serious accidents may occur if \_\_\_\_\_ is left on.

-- Pressure \_\_\_\_\_ valves should be provided with wire mesh to prevent the release of \_\_\_\_\_ inside the engine room.

-- Oil mist is created in the \_\_\_\_\_ when the lubricating oil is splashed by the \_\_\_\_\_ components of the engine.

**4. Complete the sentences with the appropriate form of the words in parentheses. (20 p.)**

-- The main shaft is supported and held in \_\_\_\_\_ (**align**) by bearings.

-- When the temperature of steam reduces, \_\_\_\_\_ (**condense**) takes place.

-- \_\_\_\_\_ (**prevent**) measures should always be taken during bunkering.

-- When the fuel reaches the \_\_\_\_\_ (**inject**) system, it should be \_\_\_\_\_ (**absolute**) free of water and foreign matter.

-- International regulations try to reduce the \_\_\_\_\_ (**emit**) of ships' fuels.

-- The \_\_\_\_\_ (**sensitive**) of the oil mist detector should be checked on a regular basis.

- The screw-type propeller is the \_\_\_\_\_ (**propel**) device used in almost all ships.
- In \_\_\_\_\_ (**control**) pitch propellers, the pitch can be adjusted by a hydraulic mechanism which allows the blades to turn on their own axis.
- Depending on the \_\_\_\_\_ (**long**) of the shaft, there can be two or more shafts coupled by bolting \_\_\_\_\_ (**arrange**).
- The authorities used \_\_\_\_\_ (**disperse**) to break up the oil spill in the Gulf of Mexico some years ago.
- The lubricating oil used in \_\_\_\_\_ (**corrode**) conditions such as lubrication of cylinder liners is mixed with certain \_\_\_\_\_ (**add**) to make it alkaline.
- Cavitation can waste power, generate \_\_\_\_\_ (**consider**) noise, create \_\_\_\_\_ (**vibrate**) and wear, and cause damage to the propeller.
- \_\_\_\_\_ (**regular**) running of the engine may be an \_\_\_\_\_ (**indicate**) of the governor's \_\_\_\_\_ (**function**).
- Materials which offer low \_\_\_\_\_ (**resist**) to electric current are called conductors.

**5. Match the words to their synonyms/definitions. There is one extra word. (15 p.)**

*condense    dependable    attempt    momentum    stationary    defect    build up*  
*choke    disperse    ductwork    impact    durable    chock    range    rupture    limited*

- standing still; not moving \_\_\_\_\_
- clog \_\_\_\_\_
- accumulate \_\_\_\_\_
- fault \_\_\_\_\_
- able to last, long-lasting \_\_\_\_\_
- effort \_\_\_\_\_
- vary between limits \_\_\_\_\_
- cause to break or burst \_\_\_\_\_
- (of a gas) become liquid, esp by becoming cooler \_\_\_\_\_
- restricted \_\_\_\_\_
- the quantity of movement in a body \_\_\_\_\_
- the total of all pipes or tubes \_\_\_\_\_
- reliable \_\_\_\_\_
- scatter or spread in different directions \_\_\_\_\_
- having a powerful influence on sth/smb \_\_\_\_\_

**6. Write the opposites of the following words. (5 p.)**

- ingress
- efficient
- manned
- reasonable
- equal
- equality
- obey
- balance
- formation
- reduce

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

**You think crankcase explosions don't happen much anymore!  
Think again!**

At 6 a.m. on November 8, 2010, the second day of a voyage from Long Beach, CA to the Mexican Riviera, the 952-foot cruise ship Carnival Splendor experienced a fire in her engine room, knocking out all electrical power on the ship. Carnival reported shortly after the incident that a "crankcase split" had caused the fire, apparently the result of a crankcase explosion in one of the diesel engines.

The fire was extinguished by that afternoon and luckily none of the nearly 4,500 passengers and crew members on board at the time was injured. The crew could not restore power to any of the engines and the ship had to be towed to San Diego over the next three days. Because of the power outage, the ship lacked food service, so passengers were fed rations delivered by U.S. Navy helicopters from the aircraft carrier USS Ronald Reagan. Carnival Splendor arrived in San Diego under tow around sunrise on November 11.

The Panamanian-flagged vessel was built by Fincantieri and entered service in 2008. Since the incident was in international waters, the flag state, Panama, initially led the casualty probe, with the U.S. Coast Guard assisting. Subsequently, for unknown reasons, the Panama Maritime Authority asked the U.S. to take over the investigation. The National Transportation Safety Board (NTSB) assigned staff to conduct the investigation, while Carnival's own engineers and representatives from both the shipyard and the engine manufacturer also investigated the incident. No definitive conclusions have yet been provided, although the focus remains on one of the diesel generators. Initial findings revealed that diesel engine number five in the aft engine room suffered a split of the crankcase and caught fire, damaging the engine control room and the electric cabling.

Carnival estimated that the cost of repairs, transport, refunds, free cruises given to displaced passengers, and the lost revenue from cancelled sailings would total \$65 million.

In a time when modern automation systems are supposed to prevent the above types of incidents from happening, these events are not rare. According to an eleven-year analysis of its classed fleet starting from 1990, Lloyds Register recorded 143 incidents of crankcase explosions, caused by bearing failures, piston failures, and other types of failures. (Retrieved: 02 September, 2017 from macsea.com)

1. What was the cause of the fire and what damage did it cause?
2. How many casualties were there?
3. How long did it take the cruise ship to arrive in San Diego? And how did she arrive there?
4. Who conducted the investigation in the first place and why?
5. What did initial findings reveal?
6. As per Lloyds Register, what are the main causes of such incidents?

**GOOD LUCK!**