Oxford Reciprocating Engines Practice Test (Sample)

Study Guide

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Questions

1. What characteristic does the scavenge pump system have in a lubrication system?

A. A by-pass in case of blockage

B. A smaller capacity than the pressure pump

C. A bifurcated tertiary drive system

D. A larger capacity than the pressure pump

2. What does the calorific value of a fuel refer to?

A. Kinetic energy contained within it

B. Heat energy in the fuel

C. Heat energy required to raise the temperature of the fuel to its boiling point

D. Heat energy required to raise the temperature of the fuel to its boiling point from absolute zero

3. In a "wet sump" oil system, where is the oil contained?

A. Engine and tank

B. Tank and oil cooler

C. Sump and tank

D. Engine and sump

4. In a four-stroke engine, combustion theoretically occurs at which condition?

A. A constant pressure.

B. A constant temperature.

C. A constant volume.

D. A constant velocity.

5. What is the purpose of a crankcase breather?

A. Maintain the oil tank pressure at atmospheric

B. Prevent distortion of the crankcase

C. Allow the oil to breathe

D. Prevent pressure building up inside the crankcase

6. In a piston engine dry sump oil system, where are the oil temperature and pressure sensed?

A. When the oil is leaving the sump.

B. For temperature when oil leaves the tank, pressure when leaving the pump.

C. When oil is entering the tank and pressure entering the pump.

D. At the same point.

7. What is a consequence of excessive valve clearance in an engine?

A. Leads to valve misfiring

B. Helps to seal the combustion chamber

C. Allows for proper valve timing

D. Ensures faster engine start

8. How can the power output of an internal combustion engine be increased?

A. By increasing the area of the cylinder.

B. By increasing the length of the stroke.

C. By increasing the engine R.P.M.

D. All of the above.

9. What defines the term "Rated Boost" in relation to engine performance?

A. The boost achieved at maximum engine speed.

B. The specified boost pressure sustained at a particular altitude.

C. The maximum boost achieved under any condition.

D. The boost available at sea level only.

10. Over boosting an engine fitted with a turbo-charger is prevented by the installation of:

A. An automatic boost control unit.

B. A manifold pressure gauge.

C. A waste gate pressure controller.

D. A suck in flap.

Answers

1. D
2. B
3. D
4. C
5. D
6. B
7. A
8. D
9. B
10. B

Explanations

1. What characteristic does the scavenge pump system have in a lubrication system?

A. A by-pass in case of blockage

B. A smaller capacity than the pressure pump

C. A bifurcated tertiary drive system

D. A larger capacity than the pressure pump

The scavenge pump system in a lubrication setup is designed to remove excess oil from the engine components and return it to the oil sump. Its primary characteristic is that it has a larger capacity than the pressure pump. This is crucial because the scavenge pump must efficiently handle and recover all the oil that has circulated through the engine and is often contaminated with impurities. Having a larger capacity allows the scavenge pump to accommodate the higher volume of oil that needs to be drained away from various engine parts, especially after lubrication has occurred. This ensures that the oil system remains effective and prevents any potential build-up of oil, which can lead to flooding or inadequate lubrication. The design keeps the lubrication system operating smoothly, maintaining proper lubrication under operational conditions. Other options denote features that do not conform to the normal functioning of a scavenge pump in this context. For example, a bypass feature is not standard in scavenge pump systems as they are primarily focused on effectively removing oil rather than managing flow in case of a blockage. Similarly, having a smaller capacity than the pressure pump would not be effective in performing its primary function. The mention of a bifurcated tertiary drive system also doesn't align with the typical design principles of scaven

2. What does the calorific value of a fuel refer to?

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The calorific value of a fuel is a critical measure that defines the amount of heat energy released during combustion. When a fuel undergoes combustion, it releases energy, which is quantified as its calorific value. This value is essential for understanding the efficiency and effectiveness of different fuels in providing energy. The correct choice indicates that calorific value refers to the total heat energy contained in the fuel, making it a crucial parameter for evaluating its suitability for energy generation. This measure helps in comparing various fuels based on how much energy they can produce, assisting in selecting the most efficient fuel for specific applications. In contrast, the other choices suggest various definitions related to energy or temperature but do not accurately represent the essence of calorific value. For example, kinetic energy pertains to the energy of motion rather than the energy released during combustion. The definitions concerning temperature changes only partially touch on relevant concepts but fail to capture the total heat energy aspect vital to the definition of calorific value. Therefore, the recognition of heat energy contained within the fuel is what distinguishes the correct answer.

3. In a "wet sump" oil system, where is the oil contained?

A. Engine and tank

B. Tank and oil cooler

C. Sump and tank

D. Engine and sump

In a "wet sump" oil system, the oil is contained within both the engine and the sump. The sump is essentially a reservoir located at the bottom of the engine where the oil collects after it circulates through the engine components. In this type of system, the oil pump draws oil from the sump to lubricate engine parts, and after its use, the oil returns to the sump. This design is common in many engines because it simplifies the oil circulation and management process, making it easier to maintain a consistent oil supply. The other options don't accurately represent the functionality of a wet sump system. For example, the inclusion of an external tank, as seen in some dry sump systems, is not a characteristic of wet sump systems, which rely on the sump integrated within the engine itself. Thus, the correct understanding of where the oil is contained in a wet sump oil system is indeed the engine and the sump.

4. In a four-stroke engine, combustion theoretically occurs at which condition?

A. A constant pressure.

B. A constant temperature.

C. A constant volume.

D. A constant velocity.

In a four-stroke engine, combustion theoretically occurs at constant volume during the compression and power strokes. This is particularly the case during the ignition phase when the fuel-air mixture is compressed in the cylinder. The process leading up to ignition is characterized by a rapid increase in pressure and temperature within a fixed volume, as the piston rises and compresses the mixture before the spark plug ignites it. At this stage, the volume remains constant while the pressure increases until the ignition point, resulting in a significant rise in temperature. After ignition, a rapid combustion process takes place, resulting in an increase in pressure as well. Understanding that combustion occurs at constant volume helps in grasping the thermodynamics involved in engine cycles and their efficiency. Constant pressure and constant temperature conditions pertain to different thermodynamic processes and are not applicable to the specific mechanics of combustion in four-stroke engines. Constant velocity does not describe a thermodynamic state relevant to combustion processes either.

5. What is the purpose of a crankcase breather?

A. Maintain the oil tank pressure at atmospheric

B. Prevent distortion of the crankcase

C. Allow the oil to breathe

D. Prevent pressure building up inside the crankcase

The purpose of a crankcase breather is to prevent pressure from building up inside the crankcase. As an engine operates, it generates various gases and vapors, including combustion gases that can seep into the crankcase from the combustion chamber. These gases can increase the internal pressure, which can lead to oil leaks, seal failures, and potentially damage engine components. The crankcase breather allows these gases to escape, maintaining a consistent internal pressure within the crankcase. This not only protects the integrity of the engine's seals and prevents oil leaks, but it also ensures optimal operation of the engine by allowing the crankcase to maintain a balanced environment. Keeping the crankcase at the proper pressure is vital for engine performance and longevity, as it supports the effective lubrication of all moving parts and reduces the risk of buildup that could otherwise hinder engine efficiency.

6. In a piston engine dry sump oil system, where are the oil temperature and pressure sensed?

A. When the oil is leaving the sump.

B. For temperature when oil leaves the tank, pressure when leaving the pump.

C. When oil is entering the tank and pressure entering the pump.

D. At the same point.

In a dry sump oil system of a piston engine, it is crucial to monitor both oil temperature and pressure to ensure proper lubrication and engine performance. The oil temperature is typically measured when the oil leaves the tank because this provides an indication of the oil's condition after it has been stored, allowing for a more accurate assessment of how well the oil is performing in terms of heat absorption and viscosity. The pressure, on the other hand, is measured when the oil is leaving the pump. This is important because the pressure reading right after the pump provides insight into the oil's ability to circulate through the engine effectively. If the pressure is too low, it could indicate that there are issues with the oil flow or that the pump is not functioning properly, which can lead to inadequate lubrication. This combination of monitoring temperature as the oil exits the tank and pressure at the pump exit is key to maintaining the engine's health and preventing potential damage due to overheating or insufficient oil flow. Thus, this choice correctly identifies the specific points where these measurements are taken, ensuring the engine's lubrication system is functioning optimally.

7. What is a consequence of excessive valve clearance in an engine?

A. Leads to valve misfiring

B. Helps to seal the combustion chamber

C. Allows for proper valve timing

D. Ensures faster engine start

Excessive valve clearance can lead to valve misfiring, primarily because it disrupts the precise timing and operation of the engine's valvetrain. In an internal combustion engine, the valves must open and close at specific intervals to ensure that air-fuel mixtures enter the combustion chamber and exhaust gases exit effectively. When the clearance is too large, the valves may not seat properly, leading to incomplete combustion as the mixture is not adequately sealed in the cylinder during the combustion process. This improper sealing results in a loss of compression, which can cause the engine to misfire since the required pressure for combustion is not achieved. Misfiring impacts engine performance, leading to rough running, increased emissions, and potentially damaging effects on other engine components over time. The other options do not accurately reflect the consequences of excessive valve clearance. For instance, excessive clearance does not help seal the combustion chamber; rather, it has the opposite effect. Similarly, it doesn't facilitate proper valve timing or ensure faster engine starts, which are critical for optimal engine function and efficiency.

8. How can the power output of an internal combustion engine be increased?

A. By increasing the area of the cylinder.

B. By increasing the length of the stroke.

C. By increasing the engine R.P.M.

D. All of the above.

To understand how the power output of an internal combustion engine can be increased, it is essential to recognize the relationship between power, engine dimensions, and operating conditions. Increasing the area of the cylinder allows for a larger volume of air-fuel mixture to be drawn into the combustion chamber. This increase in volume can lead to more power because, during the combustion cycle, a larger volume can burn more fuel, which generates more energy. Increasing the length of the stroke is another effective method to boost power output. A longer stroke means that the piston travels further within the cylinder, allowing for an increased displacement or swept volume. This results in more air and fuel entering the combustion chamber, ultimately increasing the energy produced during combustion and contributing to higher power output. Raising the engine revolutions per minute (RPM) also plays a crucial role in enhancing power. Power is directly proportional to the engine speed; as RPM increases, the number of cycles the engine can complete in a given time frame rises. Higher RPM allows for more power strokes to occur, thereby increasing the rate of energy production. In this context, all three strategies effectively contribute to the overall power output of the internal combustion engine. By implementing any one or a combination of these methods, the engine can

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C. A waste gate pressure controller.

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The installation of a manifold pressure gauge plays a crucial role in monitoring the pressure within the intake manifold of a turbocharged engine. By providing real-time data on the boost pressure, the gauge helps the operator or the engine management system to assess whether the engine is operating within safe limits. If the pressure exceeds a certain threshold indicative of overboosting, corrective measures can be implemented to prevent potential engine damage. Utilizing this gauge enables a clearer understanding of how the engine's boost levels correspond to its operational conditions, allowing for better performance tuning and safety measures. Although other devices can control or regulate boost pressure, such as an automatic boost control unit or wastegate pressure controller, the manifold pressure gauge primarily serves as the observational tool that alerts users to any potentially hazardous conditions due to excessive boost.