

Diesel Engine Fundamentals Part 2 Quiz



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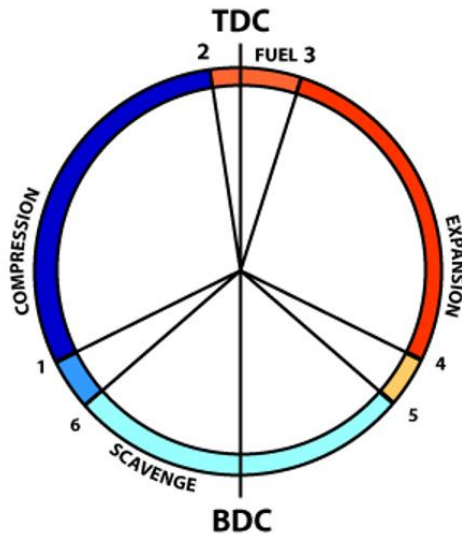
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CHAPTERS 3 - ENGINE CYCLES

QUESTION 1

A timing diagram of a diesel engine is shown in the image. What does it represent?

- a) It represents the angle of rotation of the crankshaft, the duration of the processes that occur, and the specific points of the combustion cycle i.e. the opening and closing of valves and ports, Top Dead Centre (TDC) and Bottom Dead Centre (BDC).
- b) It represents the service time which the engine will operate within a single calendar year.
- c) It represents the angle of rotation of the camshaft, the duration of the processes that occur, and the specific points of the combustion cycle i.e. the opening and closing of valves and ports, Top Dead Centre (TDC) and Bottom Dead Centre (BDC).



QUESTION 2

Which of the listed options are essential stages for all internal combustion engines? There may be more than one answer to this question.

- a) Suction
- b) Compression
- c) Exhaust
- d) Distillation
- e) Vapourisation
- f) Power

QUESTION 3

Select the option that best describes valve overlap.

- a) Valve overlap occurs when the valve lid seals tightly against the valve seat.
- b) Valve overlap is the period during which both the intake and exhaust valves are open.
- c) Valve overlap is when a valve has worn-out and needs to be renewed.
- d) Valve overlap refers to when two valves physically connect with each other when closed.

QUESTION 4

What occurs during a four-stroke engine's intake stroke? Select all correct answers.

- a) The intake valve is opened and air enters the cylinder.
- b) Air is fed into the combustion space with fuel and cooling water.
- c) Fuel is injected.
- d) For a brief period, both the intake and exhaust valves are open, and incoming air displaces exhaust gases from the cylinder.
- e) All these options.

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QUESTION 5

What occurs during a four-stroke engine's compression stroke? Select all correct answers.

- a) The intake and exhaust valves are closed.
- b) The piston travels from TDC to BDC.
- c) The piston travels from BDC to TDC.
- d) The volume in the cylinder reduces, the pressure increases, and the temperature increases.
- e) All these options.

QUESTION 6

Early or late fuel injection is inefficient and consequently not desired.

- a) True
- b) False

QUESTION 7

Injecting fuel into the combustion space too early may cause a symptom known as 'knocking'.

- a) True
- b) False

QUESTION 8

What occurs during a four-stroke engine's power stroke? Select all correct answers.

- a) Intake and exhaust valves are closed.
- b) Exhaust gases leave the cylinder through the open exhaust valve(s).
- c) Charge air has been compressed, fuel has been injected and combustion occurs.
- d) The piston travels from TDC to BDC.
- e) The piston travels from BDC to TDC.
- f) All these options.

QUESTION 9

In a four-stroke diesel engine, approximately 45% of the heat from combustion is converted to useful work. How is the remaining heat distributed?

- a) Approximately 25% is rejected to the cooling water system.
- b) Approximately 50% is utilised by the turbocharger to compress incoming air.
- c) Approximately 30% is rejected through the exhaust system.
- d) All these options.

QUESTION 10

What occurs during a four-stroke engine's exhaust stroke? Select all correct answers.

- a) The piston travels from TDC to BDC, the intake valve opens, and fresh air enters the cylinder.
- b) The exhaust valves open and exhaust gases flow into the exhaust gas manifold.
- c) The piston travels from TDC to BDC and the exhaust gases are expelled.
- d) The piston travels from BDC to TDC and the exhaust gases are expelled.
- e) All these options.

QUESTION 11

Four-stroke engines are more efficient than two-stroke engines because the timing of the valve opening and closing cycles, and fuel injection timing, can be better controlled.

- a) True
- b) False

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QUESTION 12

In a four-stroke engine, the camshaft is geared with the crankshaft and rotates:

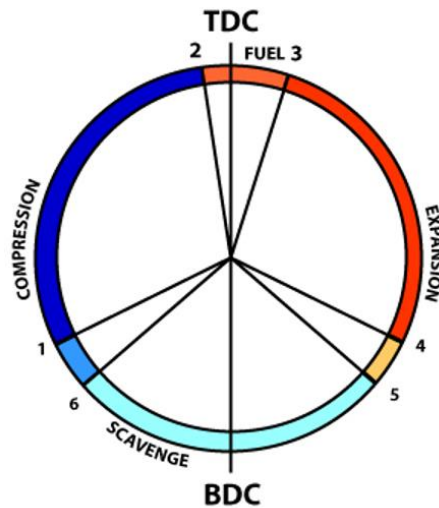
- a) At the same speed as the crankshaft (1:1)
- b) At half the speed of the crankshaft (1:2)
- c) At twice the speed of the crankshaft (2:1)

CHAPTER 4 - DETAILED TWO-STROKE ENGINE CYCLE

QUESTION 13

A timing diagram of a diesel engine is shown. Is the image based upon a two-stroke engine, or a four-stroke engine?

- a) Four-stroke engine.
- b) Two-stroke engine.



QUESTION 14

Which statement, or statements, best describe a four-stroke engine's compression stroke?

- a) The piston travels towards BDC, the inlet ports are opened, and air enters the cylinder.
- b) The piston travels towards TDC and the exhaust gases are expelled.
- c) The cylinder temperature increases as the piston travels from BDC to TDC.
- d) The cylinder pressure increases as the piston travels from BDC to TDC.
- e) The cylinder volume decreases as the piston travels from BDC to TDC.

QUESTION 15

Which statement, or statements, best describe a four-stroke engine's exhaust stroke?

- a) The piston travels towards BDC, the inlet ports are opened, and air enters the cylinder.
- b) The piston travels towards TDC and the exhaust gases are expelled.
- c) The cylinder pressure increases as the piston travels from BDC to TDC.
- d) The piston travels from TDC to BDC.

QUESTION 16

Which statement, or statements, best describe a four-stroke engine's power stroke?

- a) Combustion occurs causing a sudden decrease in cylinder volume.
- b) Combustion begins shortly before TDC.
- c) Combustion occurs causing a large increase in cylinder pressure.
- d) A controlled explosion occurs causing the piston to travel towards BDC.
- e) Combustion occurs causing a large increase in cylinder temperature.
- f) All these options.

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QUESTION 17

How many crankshaft rotations does a two-stroke engine require to complete one combustion cycle?

- a) Two.
- b) One.
- c) Four.

CHAPTER 5 - MAINTENANCE STRATEGIES

QUESTION 18

Select all common maintenance strategies.

- a) Breakdown/Reactive maintenance.
- b) Preventive maintenance.
- c) All these options.
- d) Predictive maintenance.
- e) Reliability centred maintenance (RCM).

QUESTION 19

Which of the statements best describes a reactive maintenance strategy?

- a) Maintenance actions performed based upon a schedule (time, service hours, or km/mile based etc.).
- b) The 'run it until it breaks' maintenance strategy. No actions or efforts are taken to maintain equipment.

QUESTION 20

What are the advantages of a reactive/breakdown maintenance strategy?

- a) Increased useful working life of equipment.
- b) Reliable plant operation.
- c) Low initial cost.
- d) No manpower or capital expenses until something breaks.

QUESTION 21

Which of the statements best describes a preventive maintenance strategy?

- a) Preventive maintenance is the 'run it until it breaks' maintenance strategy. No actions or efforts are taken to maintain equipment.
- b) Actions performed are based upon a schedule. Performed actions should detect, preclude, or mitigate degradation of a component or system.
- c) Measuring equipment is used to continually condition monitor equipment until such time as maintenance intervention is required.

QUESTION 22

What are the advantages of a preventive maintenance strategy?

- a) Cost effective in many capital-intensive processes.
- b) Increased useful working life of equipment.
- c) No inventory of spare parts required.
- d) Reduced unscheduled outages and process interruptions.
- e) Estimated 12% to 18% cost savings compared to reactive maintenance programs.
- f) No manpower or capital expenses until something breaks.

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QUESTION 23

Which of the statements best describes a predictive maintenance strategy?

- a) Predictive maintenance is the 'run it until it breaks' maintenance strategy. No actions or efforts are taken to maintain equipment.
- b) Predictive maintenance occurs based upon the actual condition of a machine rather than on a pre-set schedule.

QUESTION 24

What are the advantages of a predictive maintenance strategy?

- a) Increased useful working life of equipment.
- b) Allows for pre-emptive corrective actions.
- c) No need to invest in expensive diagnostic equipment.
- d) Decrease in equipment and process downtime (reduced business interruption).
- e) No manpower or capital expenses until something breaks.
- f) Estimated 8% to 12% cost savings compared to preventive maintenance programs.

QUESTION 25

Which of the statements best describes a reliability centred maintenance (RCM) strategy?

- a) A maintenance strategy used to determine the maintenance requirements of any asset within a system, and its criticality.
- b) Reliability centred maintenance (RCM) is the 'run it until it breaks' maintenance strategy. No actions or efforts are taken to maintain equipment.
- c) Measuring equipment is used to continually condition monitor equipment until such time as maintenance intervention is required. The criticality of the equipment is irrelevant.

QUESTION 26

What are the advantages of a reliability centred maintenance (RCM) strategy?

- a) Can be the most efficient maintenance program.
- b) Lowers costs by eliminating unnecessary maintenance interventions.
- c) No need to invest in expensive diagnostic equipment.
- d) No inventory of spare parts required.
- e) Minimised frequency of maintenance interventions.
- f) No manpower or capital expenses until something breaks.
- g) Reduced probability of sudden equipment failures.
- h) Ability to focus maintenance activities on critical components.
- i) Reduced probability of process interruption (business interruption).

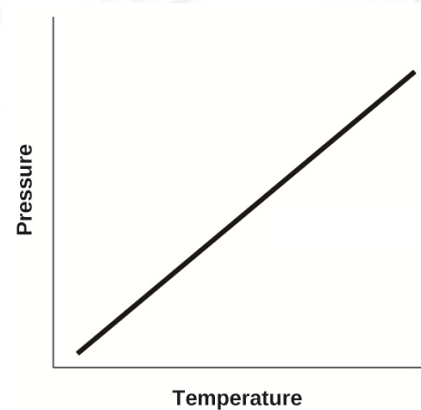
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CHAPTER 6 - THERMODYNAMIC CYCLES

QUESTION 27

Amonton's law describes the linear relationship between pressure and temperature when volume is held constant. Select the option that best describes Amonton's law.

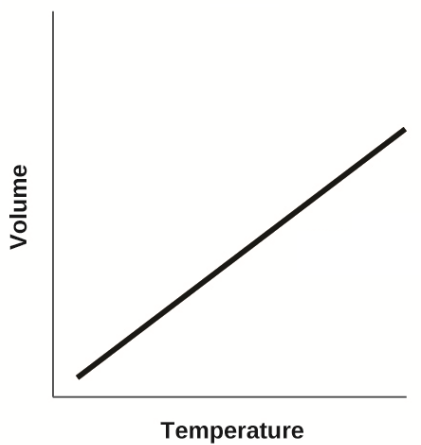
- a) At constant volume, an increase in temperature will cause an increase in pressure, and vice versa.
- b) At constant volume, an increase in temperature will cause a decrease in pressure, and vice versa.



QUESTION 28

Charles' Law describes the relationship between volume and temperature when pressure is held constant. Select the option that best describes Charles' law.

- a) At constant pressure, an increase in temperature will cause a decrease in volume, and vice versa.
- b) At constant pressure, an increase in temperature will cause an increase in volume, and vice versa.



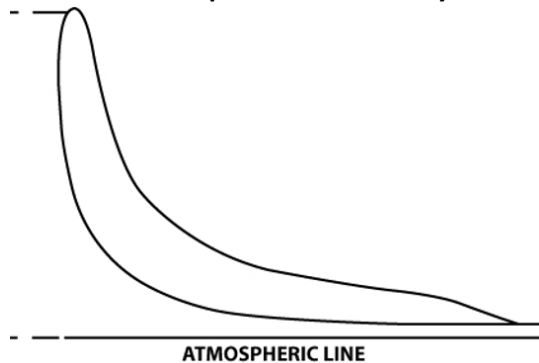
QUESTION 29

Which of the shown options are thermodynamic cycles (gas cycles)? There may be more than one correct answer to this question.

- a) Otto Cycle (petrol engines).
- b) Bryton Cycle (combustion turbines).
- c) Diesel Cycle (diesel engines).
- d) All these options.

QUESTION 30

Power cards (see image) indicate what is occurring within the combustion space. They are used in both large and medium sized engines. What information do power cards convey?

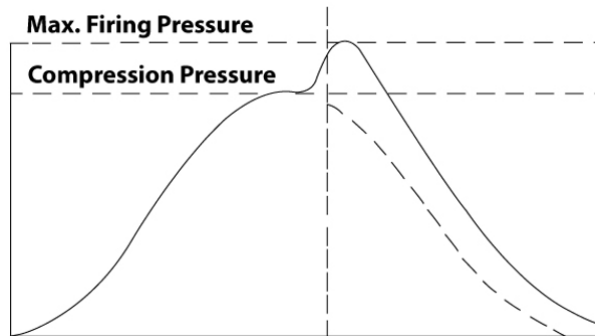


- a) The Y axis (vertical axis) indicates temperature.
- b) The Y axis (vertical axis) indicates pressure.
- c) The x axis (horizontal axis) indicates crankshaft position in degrees.
- d) The x axis (horizontal axis) indicates volume.

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QUESTION 31

Compression diagrams help reveal what is occurring within the combustion space. They are used in both large and medium sized engines. What information do compression diagrams convey?

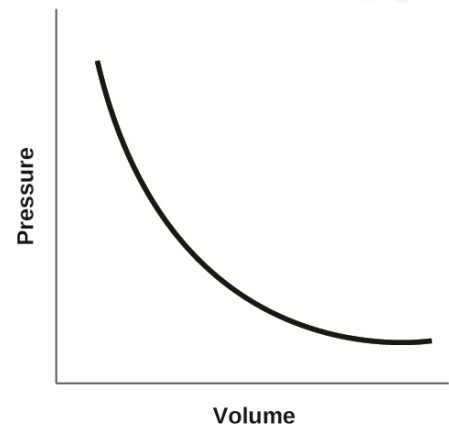


- a) The x axis (horizontal axis) indicates degrees of crankshaft rotation.
- b) The x axis (horizontal axis) indicates volume.
- c) The Y axis (vertical axis) indicates pressure.
- d) The Y axis (vertical axis) indicates temperature.

QUESTION 32

Pressure and volume diagrams (PV diagrams) indicate the relationship between pressure and volume at constant temperature. What information do PV diagrams convey?

- a) An increase in pressure will cause a decrease in volume, and vice versa.
- b) An increase in pressure will cause an increase in volume, and vice versa.
- c) None of these options.



CHAPTER 7 - ENGINE PROTECTION

QUESTION 33

Select all the protective alarms and trips that most diesel engines have as a minimum requirement:

- a) Overspeed.
- b) High vibration alarm.
- c) High jacket water temperature alarm.
- d) High charge air temperature alarm.
- e) High exhaust gas temperature alarm.
- f) Low lubrication oil pressure trip and/or alarm.
- g) High exhaust gas velocity.

QUESTION 34

With reference to high crankcase pressure, which of the shown statements is true?

- a) High crankcase pressure is often caused by blow-by (combustion gases passing the piston rings and entering the crankcase).
- b) A high crankcase pressure alarm is fitted to most medium to large sized diesel engines.
- c) High crankcase pressure often indicates that the engine is in poor condition.
- d) All these options.

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QUESTION 35

With reference to low lubrication oil pressure, which of the shown statements is true?

- a) Low lubrication oil pressure, or a complete loss of oil pressure, can render an engine totally inoperable within a very short space of time.
- b) Loss of oil pressure can result in the engine seizing (stopping) due to lack of lubrication.
- c) A low lubrication oil pressure event will usually activate an alarm.
- d) A very low lubrication oil pressure event will shut down the engine.
- e) All these options.

QUESTION 36

Exhaust gas temperatures provide a vast amount of information regarding the operating condition of the engine. Select all options that are true.

- a) High exhaust gas temperatures indicate engine overloading and/or inadequate scavenging.
- b) High exhaust gas temperatures can render an engine totally inoperable within a very short space of time.
- c) A high exhaust gas temperature scenario will usually shutdown the engine.
- d) Extended engine operation with high exhaust gas temperatures may result in damaged exhaust gas valves.
- e) All these options.

QUESTION 37

With reference to engine overspeed, which of the shown options are true?

- a) An overspeed device will stop/isolate fuel to the engine if a pre-defined rpm setpoint is exceeded.
- b) An overspeed condition is extremely dangerous because engine failure is usually catastrophic.
- c) Because diesel engines are not self-speed limiting, a failure in the governor, injection system, or sudden loss of load, can cause the engine to overspeed.
- d) All these options.

CHAPTER 8 - ENGINE STARTING CIRCUITS

QUESTION 38

Diesel engines can be started pneumatically, electrically, hydraulically or manually. How is a diesel engine initially started?

- a) A force is applied to the engine so that the crankshaft is rotating prior to fuel injection.
- b) Fuel is injected when the engine is stationary, it combusts, and the engine crankshaft begins to rotate.
- c) All these options.

QUESTION 39

Concerning glow-plugs, which of the shown options are correct?

- a) Glow-plugs are located in the cylinder head.
- b) Once an engine is running/operational, glow-plugs are no longer required.
- c) All these options.

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CHAPTER 9 - ENGINE CONTROL

QUESTION 40

Control of a diesel engine is accomplished through several components. Together, these components ensure that the engine operates at the desired speed. These components are:

- a) Camshaft (for valve and fuel injection timing).
- b) Fuel injector (for metering and injecting the fuel).
- c) Governor (for varying the amount of fuel sent to the injectors).
- d) All these options.

QUESTION 41

An engine governor can increase the engine rpm, decrease the engine rpm, or maintain a desired rpm.

- a) True
- b) False

QUESTION 42

What are the types of speed regulating governors?

- a) Constant speed governors.
- b) Variable speed governors.
- c) Speed limiting governors.
- d) Load limiting governors.
- e) All these options.

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ANSWERS

1. a
2. a/b/c/f
3. b
4. a/d
5. a/c/d
6. a
7. a
8. a/c/d
9. a/c
10. b/d
11. a
12. b
13. b
14. c/d/e
15. b
16. b/c/d/e
17. b
18. c
19. b
20. c/d
21. b
22. a/b/d/e
23. b
24. a/b/d/f
25. a
26. a/b/e/g/h/i
27. a
28. b
29. d
30. b/c
31. a/c
32. a
33. a/c/e/f
34. d
35. e
36. a/d
37. d
38. a
39. c
40. d
41. a
42. e