

2017

1. What does it mean the term combustion chamber?
 - Combustion chamber :is the space between the top of the piston and the cylinder
2. What are the disadvantage of using diesel engine passenger car
 - Low power output difficult cold weather starting
 - Noise exhaust emission
3. Give the five procedure of cylinder leakage
 - Make sure the engine is of operation
 - Remove the radiator cup, oil filter cup, dipstick, air filter cover and all spark plug
 - Rotate the crank shaft with remote starter button so that the piston of the tested cylinder is at TDC on it compression stroke this ensure that the valves of that cylinder are closed
 - Insert the threaded adapter an the end of the tester air pressure into the spark plug hole
 - Allow the compressed air to enter the cylinder
 - Listen and feel to identify the source of any exhausting air
4. Explain four steps of oil pressure testing are:
 - Remove the oil pressure sensor and tighten the thread end of gouges hose into the bore
 - Turn the engine until t it reach reached normal operating temperature
 - Observe the gouge reading while the engine is running at about 1000rpm and at 2500rpm or the specified engine speed
5. What are four main part of diesel injectors are:
 - Heat
 - Injector body
 - Diesel injector needle
 - Injector pressure chamber
6. What are three factors depend up on of the amount or quantity of heat energy required to raise the temperature of material
 - The mass of material
 - The temperature
 - The raise in temperature of material
7. Water in cooling system of motor circulates at the rate of 0.2 liters per second, and the temperature rises from 42°c to 90°c . If the specific heat capacity of water is 4.2kJ/kg k , calculate the amount of heat energy absorbed by the cooling water per minute (mass of 1 liter of water =1kg)

➤ Given Data

Rate of water = 0.2 L/sec

$T^{\circ}=42^{\circ}\text{c}$ to 90°c

Specific heat capacity of water = 4.2kJ/Kg.k

Mass of water = 1L = 1kg

Mass of cooling water circulating per Minute : $0.21 \times 60 = 12\text{kg/min}$

Temperature rise = $90 - 42 = 48\text{k}$

Heat energy absorbed by cooling water per minute = mass \times specific heat capacity \times temperature rise
 $= 12\text{kg} \times 4.2\text{kJ/Kg.k} \times 48\text{k} = 2419\text{kJ}$

8. What are the difference between the melting point and the freezing point
- The melting of a substance: is the temperature at which the change of state from solid to liquid occurs
 - The freezing point of a substance: is the temperature at which the change state of state from liquid to solid occur
9. A compression ignition engine has a compression ratio of 16 to 1 and the air pressure at the commencement of the compression stroke is 85kpa abs, the temperature being 47°c . Calculate the temperature at the end of compression stroke when the pressure per minute (mass of 1 liter of water = 1kg)
- Given data

$$\Sigma = 16 \text{ TO } 1$$

UNKNOWN

$$P_1 = 85\text{Kpaabs}$$

$$T_2 = ?$$

$$P_2 = 3400\text{Kpaabs}$$

FORMULA

$$T_2 = 47 + 273 = 320\text{K}$$

$$N = P_1 X V_1 / T_1 = P_2 X V_2 / T_2$$

$$\Sigma V = V_1 / V_2 = 16$$

$$P_1 X V_1 X T_1 = P_2 X V_2 X T_2$$

$$T_2 = P_2 X V_2 X T_1 / P_1 X V_1 = P_2 X T_1 / P_1 X 1$$

$$= 3400 X 320 / 85 X 16 = 800\text{K}$$

Temperature At The End Of Compression = $800 - 273$

$$= 527^{\circ}\text{C}$$

10. What are the three phase of diesel ignition

- Rapid combustion
- Controlled combustion
- Ignition delivery

11. Outline three purpose of coolant

- Protect the engine and cooling system from rust and corrosion
- Transfer heat from the engine to the radiator
- Prevent freezing in the cold climate

12. State five properties of water in cooling system

- It is expensive
- It is an efficient heat exchange fluid because of it excellent thermal conductivities (ability of a material to conduct heat)
- It has good specific heat capacity, means it takes more heat energy to increase the temperature versus one with low specific heat capacity
- The boiling point is 100°C (at sea level)
- The freezing point is 0°C

13. Explain the four advantages of dry sump system

- A shallow oil pan allows the engine to be mounted lower in the vehicle to improve cornering
- The oil capacity can greatly expand because the size of the reservoir not limited. A large quantity of oil means that the oil temperature can be controlled
- Dry sump system allow the vehicles to caver and brake for long period, which is not able to be done with wet sump system due to oil being thrown to one side away from the oil pick up

14. What are two needs the exhaust system is designed to meet

- Provide the possible amount of retraction or back pressure
- Keep the exhaust noise at the minimum

SECTION B

15. What are the problems can cause unequal cylinder power balance test? How can you prevent them(each one)

- Defective ignition coil
- Defective spark plug
- Damaged head gasket
- Defective or worn spark warn piston ring
- Damaged or burned vales
- Broken valve spring
- Worn cam shaft leaking in take man fold
- Fluty fuel injectors damaged piston

16. Find the mass of cooling water required to condense 5kg of stem at atmospheric pressure and temperature of 100°C ,and then to cool the resulting water to 60°C ,if the permissible of the cooling water is 30k. Specific heat capacity of water = 4.2 kJ/kg k specific latent heat of evaporation of stem = $2,260\text{kJ/ kg}$

- given data : m of water=5kg

$$t_1 = 100^\circ\text{C} \quad t_2 = 60^\circ\text{C} \quad t_3 = 30^\circ\text{C}$$

$$q_2 = 2,260 \text{ kJ/kg}$$

$$q_1 = 4.2 \text{ kJ/kg}\cdot\text{K}$$

✓ possible heat given by steam by vaporizing

$$= m \times \text{specific latent of vaporization}$$

$$= 5 \times 2260 \text{ kJ/kg} = 11,300 \text{ kJ}$$

✓ heat given up the condensed steam cooling from 100°C to 60°C

$$= m \times c \times \Delta t = 5 \times 4.2 \times (100 - 60) = 840 \text{ kJ}$$

✓ total heat given up by the steam and water = 11,300 + 840 = 12,140 kJ

this amount of heat energy is absorbed by the cooling water, set in kg be required mass of the cooling water

✓ then heat observed by cooling water = $m \times \text{specific heat capacity} \times \text{temperature rise}$

$$= m \times 4.2 \times 30 = 126m \text{ kJ}$$

We know that 126m kJ = 12,140 kJ

$$m = 12,140 \text{ kJ} / 126 = 96.35$$

The mass of cooling water required = 96.35 kg

17. Discuss the possible causes and remedies of leakage of coolant

Possible causes	Remedies
1. fault radiator cap	Repair filler cap
2. defective radiator	Repair radiator
3. bad thermostat housing gasket	Test thermostat/replace gasket
4. cracked or deteriorated hose	Repair radiator hose
5. defective heat hose	Repair heat hose
6. defective heat core	Repair heat core

7.faulty heater water control valve	Replace water pump seal
8.defective water pump seal or gasket	Replace water pump seal
9.rusted or core hole plugs	Repair core hole plugs
10.damaged coolant reserve	Repair coolant reserve
11.bad cylinder head gasket	Replace cylinder head gasket
12.cracked cylinder head manifold or block	Repair cylinder head manifold or block

18. Debate on the cause and possible remedies of noisy pistons, pins, or rings

Causes	Remedies
1.excessive piston to cylinder wall clearance	Horning cylinder wall
2.collapsed piston skirt	Repair piston skirt
3.loose piston stroke	Repair piston stroke
4.incorrectly filed piston pin	Correctly piston pin
5.misaligned connecting rod	Aligned correcting rod
6.excessive carbon deposit on piston	Clean carbon deposit on piston
7.piston ring striking ridge at top of cylinder wall	Replace piston ring
8.broken ring	Replace ring

19. Discuss the cause and possible remedies of hard starting on diesel engine.

Causes	Remedies
1.air in fuel system	Bleed fuel
2.clogged fuel filter	Replace fuel filter
3.defective feed pump	Repair
4.blocked fuel supply line	Clean fuel supply line
5.blocked fuel injection	Clean injection line
6.defective injection pump	Replace injection pump
7.incorrect injection timing	Correct injection timing
8.defective preheating devise	Repair preheating devise
9.low engine compression	Test compression of the engine

SECTION C:

20. Explain the process of the inspect fuel system in tune up?

- Torque the intake manifold attaching bolts
- Check the free doom of operation of manifold heat control valve, if so equipped
- Check the component of the thermostatically controlled air cleaner, if equipped
- Service air filler and fuel filter, clean or replace the elements or repaired
- Tighten the carburetor a fuel injection system attaching nuts or bolts
- Clean automatic choke mechanism and check the check valve and linkage
- Check the adjustment of the check

- Check the component of throttle body injection (TBI) inspect or individual part injection system including various sensors actuators and control circuits
- Inspect fuel lines, hoses and connections for fuel leaks
- Check the operation of accelerator linkage
- Check fuel tank for leaks, check the connection of the fuel tank filler cap
- Check the evaporative emission system hoses, canister and filter
- Test the fuel pump pressure, capacity (volume) and vacuum
- Service the positive crank ventilation (PVC) system
- Check the condition of all emission control system

21. Discuss the possible cause and remedies of engine overheat?

Causes	Remedies
1.incorrect adjustment of idle needle valve	
2.incorrect float level	
3.sticking float needle valve	Replace float needle valve
4.defective gasket between carburetor and manifold	Replace gaskets
5.defective gasket in carburetor	Replace gaskets in carburetor
6.loose carburetor to manifold nuts	Repair carburetor to manifold nuts
7.loose intake attaching bolts	Install attaching bolts
8.idle discharge hoses part clogged	Clean holes
9.defective automatic choke	Repair automatic choke
10.loose jet in carburetor	Repair jet
11.worn main metering jet	Repair vacuum line
12.leakage vacuum line	Repair/adjust idle for rich
13.restricted or clogged	Repair worn main jet
14.high air cleaner float level	Clean air cleaner
15.defective sensor	Replace sensor
16.defective computer	Repair/replace computers