

Knowledge Of Material And Automotive Technology National Exam Correction 2013

SECTION A

1. Cooling system contain 15kg of water calculate the quantity of heat gained by the water if the temperature rises from 12^oc to 88^oc starting
 - $Q = M.C.DT$
 $= 15 \times 4.18 \times (88 - 12) = 4765.2 \text{ kJ}$
2. What are the advantages of an electricity driven fan
 - The fan only operates when the engine reaches a predetermined temperature
 - The engine will be more efficient as the fan is not being driven all the time
 - The radiator and fan can now be fitted in a convenient position for transversely mounted
 - The fan assembly can be mounted in front of or behind the radiator
 - Engine temperature is more closely controlled as the temperature sensor will automatically turn the fan on and off within very close limits as required
 - To reduce fan noise – constant operation temperature
 - Reduce fuel consumption long service life
3. What can the corrosion of material be influenced
 - The chemical composition
 - The percentage purity
 - Surface quality
 - by the composition of the corrosive medium
 - By the pressure and temperature of corrosive medium
4. What do you understand by “case hardening”
 - Hardening is a heat treatment process in which a surface zone of the piece of low carbon steel is enriched with carbon and hardened
5. What are three ways in which the rod is attached to the piston
 - Floating mounting (has arrangement free floating)
 - Close sliding or interference fit (free in connecting rod fix in piston)
 - Shrink fit is to press fit the piston pin into the connecting rod
6. Explain the term LH Motronic
 - LH Motronic: is an electrically controlled fuel injection system with multi point injection in which the air mass is used as one of the main controlled variables or L-H motronic injection is an electric fuel injection system and ignition system are controlled by common ECU

7. How many times does the crank shaft turn while the cam shaft turns once
- The crank shaft must turn two times to turn the cam shaft once
8. A. What does the term “engine efficiency” mean
- Engine efficiency: is the ratio between the power delivered and the power that called be obtained if the engine operated without any power

B. How can it can be completed in two ways

- $\eta_{\text{mechanical}} = \frac{\text{power out}}{\text{power in}} = \frac{\text{brake power}}{\text{indicate power}}$

$$\eta_{\text{thermal}} = \frac{\text{work done per second}}{\text{heat energy supplied from fuel per second}}$$

9. Name four technological properties of material

- Machinability
- Formality
- Weld ability
- Cast ability

10. A cross section area (CSA) of the of the piston crown is 48.5cm^2 and the stroke is 12cm. Calculate swept volume of the cylinder and the capacity of the engine if it has six cylinder

- Swept volume = CSA x length of stroke

$$= 48.5\text{cm}^2 \times 12\text{cm} = 582\text{cm}^3$$

- Capacity = swept volume x n^o of cylinder

$$= 582\text{cm}^3 \times 6 = 3492\text{cm}^3$$

11. Suppose that an engine uses two belts to drive the water pump and alternator it all right to replace only one belt if one is damaged? Why?

- All should be replaced at the same time otherwise the new belt will take most of the driving effect and will wear body

12. What important factors must born in mind when laying fuel line

- They are use able to withstand the torsion of the vehicle and the movement of the engine
- They are protected mechanical damaged
- The line are not routed pas in order to avoid the vapor bubbles formation
- No fuel vapor can collected in the event of leaks
- They are where possible laid in a steady rising direction so that vapors bubbles can be quickly removed from the system

13. How many valves does the radiator pressure cup have?

- Two valves
 - ❖ Blow off valves or pressure relief valve: if the pressure rises above off valves is raised off its seats. This relieves the excessive pressure
 - The vacuum valves :prevent the formation of vacuum in the cooling when the engine has been shut off and begin to cool
14. What is likely to happen if the radiator cap removed quickly when the engine is hot
- This will allow the water to boil violently resulting jack of steam and water from open filler can cause very serious injuries.
15. What are the four basic's system that every engine must have
- Fuel system
 - Ignition system
 - Lubrication system
 - Starting system
 - Air induction system
16. Name the four places on the automobile from which pollutant can come
- The fuel tank
 - The crank case
 - Tail pipe (exhaust pipe)
17. What two parts the reciprocating motion of the piston to the rotary motion of the crank shaft
- Connecting rod
 - Crank shaft
 - Guide pin

SECTION B

18. What are the ten physical properties of material
- Density
 - Thermal expansion
 - Thermal conductivities
 - Ductility
 - Strength
 - Melting temperature
 - Stress
 - Plasticity
 - Elasticity
 - Brittleness
 - Hardness
 - Electronic conductivities
19. A. What are the function of cylinder and cylinder head and what the stress are the cylinder and cylinder exposed

- Function: 1, to form the combustion chamber to gather with the piston 2, guidance of the piston by the cylinder

✓ **Stress:**

- 1, high combustion pressure and temperature
- 2, large thermal stress due to rapid temperature
- 3, cylinder barrel subjected to wear due to piston friction and combustion chamber residues
- 4, increase friction during starting un carbureted fuel washes lubricant layers off cylinder

B. Which properties is the cylinder meant to have

- High strength & in the rent stabilities
- Good heat conduction
- Low thermal expansion
- High resistance to wear
- Good sliding properties for the cylinder face

20. Ten (10) reason the engine became over heating

- Loose/broken/worn or incorrect fan belt tension
- Defective thermostat
- Water pump impeller loose on shaft
- Restricted circulation through radiator hose
- Radiator air way chocked
- Incorrect ignition timing
- Incorrect valve timing
- Tighten engine
- Low oil level
- Insufficient coolant in system
- Defective of cylinder head gasket
- Oil filter clogged
- Defect of radiator cap and engine mechanical wear

21. Make a list of cooling system and check

- Check the coolant level

- Checking the coolant antifreeze strength
- Testing the thermostat
- Checking the loose and hose connection
- Testing the water pump
- Checking for exhaust gas leakage into system
- Pressure testing the system and cap
- Checking the fan belt for wear and tension
- Checking system for accumulation of rust and scale

22. What are the advantages and disadvantages of air cooling

Advantages:

- Simple design
- Low weight to power ratio
 - No coolant antifreeze required
- Extensively maintenance free

Disadvantages:

- Greater fluctuation in the operating temperature
- Power requirement of the radiator fan is comparatively high
- Louder noise emanating from the fan due to the lack of coolant jacket
- Greatly delayed and non-uniform passenger compartment heating
- Poor heat transfer between cooling fins and air cannot be regulated

23. A) name possible cause of low oil pressure and excessive oil pressure

- A weak relief valves spring
 - Worn oil pump
 - Broken or cracked oil line
 - Abstraction in the oil lines
 - Insufficient or excessively thin oil
 - Bearing that are so body worn that they can pass more oil than the oil pump is capable of delivering
 - Defective oil pressure indicator may be recording
- Excessively oil pressure may result from:
- A stick relief valves
 - An excessively strong valves spring
 - A clogged oil line
 - Excessively heavy oil
 - A defective oil pressure indicator the way read high

B) what is viscosity?

- Refers to the tangency of oil to resist flowing

24. After mounting the injection pump to the engine and check clearance is correct it is necessary to bleed the fuel system and run the engine describe the procedure?

- Disconnect the pressure side of the lift pump
- Operates the lift until the fuel from air bubbles flow from the out let
- Reconnect the fuel line
- Slacken off the bleed screw of fuel filter
- Operate the lift pump until all the air is expelled from the filter
- Re-tighten the bleed screw
- Open the bleed screw (vent screw) on the injection pump
- Operate the lift pump again
- When a fuel free from air bubbles comes out re-tighten the screw

May also necessary to bleed the high pressure pipe to the injection

- Slacking the union at the injection and
- Operate the starter until small amount of the fuel can be seen to coming from the union
- Retighten the union and operate the starter to run the engine

25. Make a list of the possible cause of engine over heating including those not caused by cooling system problem

- High altitude operation
- Insufficient oil
- Overloading of the engine
- Hot climate operation
- Improperly timed ignition
- Long period of slow speed
- Idling operation
- Defective of cylinder head gasket
- Oil filter clogged
- Piston ring defective
- Defective of cylinder head
- Defective of cylinder block