

2016

- They can be replaceable instead of changing of whole block in case of wet sleeves
 - Providing for good cooling effect
 - They have long service life of an engine
 - Resistant to wear than the cylinders barrels
2. Two common types of valve guide used in thermal engine
- Internal valve guide
 - Pressed in guide
 - Special cost iron valve guide
 - Cost bronze valve guide
3. The function of the relief valve (by pass valve) in the lubricating system
- Protect lubricating system from over pressure
 - Protect the lubricating system component from being destroyed
 - To keep the normal operating of the system
 - Allow excessive oil to be cooled
 - To bypass oil when the filter is clogged
4. Explain briefly The function of the valve seal
- To prevent the oil from leaking out
 - To prevent mechanical wear due to mental contact
 - To prevent oil entering to the combustion chamber
 - Resistant to wear
5. What could be happened If thermostat is not opening when the coolant reach a recommended opening temperature
- The engine will be over heating
6. A) what is the melting temperature of grey cast iron
1200⁰c 1300 1150⁰c 1250⁰c

B) a gasoline engine develop pressure of 45 bar the bore diameter is 86 mm. Calculate the force exerted by the gas explosion the piston (in newton)

Given Data

$P=45\text{bars}=45.10^5\text{Pa}=45.10^5$ asked

$D=86\text{mm}=0.086\text{m}$ $F=?$

Formula:

$$P = F/A \text{ so } F = P \cdot A$$

$$A = 3.14 \cdot (0.086\text{m})^2 / 4 = 0.0058058\text{m}^2$$

$$F = P \cdot A = 45.10 \text{ N/m}^2 \cdot 0.0058058 = 26126.37\text{N}$$

7. What are the classification of engine according to the arrangement of valves

- ✓ side valve engine
- ✓ overhead valve engines

b. the classification of engine according to the arrangement of cam shaft

- ✓ Overhead cam shaft (OHC)=single overhead camshaft
- ✓ Double overhead cam shaft (DOHC)
- ✓ Overhead valve engine (OHV)
- ✓ Cam shaft in head (CIH)

8) What are the function of connecting rod?

- ✓ Connect the piston to the crank shaft
- ✓ Convert the linear motion of piston into rotary motion of the crank shaft
- ✓ Transmit piston force to the crank shaft where it generate the torque

9) Give the advantage of common rail injection system

- ✓ Reduction of fuel consumption
- ✓ Better distribution of fuel
- ✓ Reduction of pollutant emission
- ✓ Increase the engine torque
- ✓ Good engine performance
- ✓ Possible electronic control

10) List four method for checking injectors

- ✓ Visual check
- ✓ Function check (injection pressure)
- ✓ Sound operation check
- ✓ Measurement check

- ✓ wave form
- ✓ resistance
- ✓ Checking leakage
- ✓ Checking spray shape

11) What are the functions of the following components of an air conditioning system?

A) Evaporator: absorbs heat from the passenger compartment

: accumulates warm/cold air

B) Condenser: condenses the gas into a liquid either as part of a steam engine or a similar machine

Cools refrigerants down rapidly

C) a/c air compressor: generates pressure of refrigerant gas down in circulation

Draws in gaseous refrigerants and compresses them

It feeds gaseous refrigerants to the condenser at a pressure of about 16 bars

Q12 Give the comparison between diesel common rail and diesel pump

Diesel common rail	Diesel injection pump
Many moving parts	Few moving parts
Heavy	not heavy
Short service life	Long service life
Require high maintenance	Low maintenance
High fuel consumption	Reduction of fuel consumption
High pollutant emission	Reduction of pollutant emission
Mechanical	Full electronic

13. Give the advantages of common rail injection system

- ✓ High engine power
- ✓ Low fuel consumption
- ✓ Low exhaust gas value
- ✓ High engine torque
- ✓ No mechanical parts

Q14 list and explain the four kind of vehicle emission

- Hydrocarbon (HC) :are created by unburned fuel entering the atmosphere fuel that not combusted properly
- Carbon monoxide oxide of nitrogen (NOX) are formed when the nitrogen and O_2 mix under high temperature
- (CO) is caused incomplete combustion of fuel
- Particulates are sort of particles caused by fuel additives
- Exhaust gas emission the exhaust gas are composed by various toxic gases such as(NOX ;CO , HC)
- Oil vapors emission from crank case due to temperature of oil in the same vapor flow through the atmosphere
- Emission due to unburned fuel (incomplete combustion)
- Emission due to rich and lean mixture
- Emission due to refrigerant gases

Q15 list and explain the six basic part of turbo charger are

- Turbine wheel: it is located in turbine housing and is mounted in one end of the turbine shaft (exhaust side)
- Compressor wheel :it is located in the compressor housing and is mounted on the opposite end of the turbine shaft to form an internal ratio
- Drive shaft :this is the mechanical linkage between the the turbine wheel and compressor wheel
- Turbine wheel housing :it enclose s the turbine wheel and provide flanged exhaust gas in let and auxiliary located turbo charger exhaust
- Compressor wheel housing it encloses the compressor wheel and provide an ambient air inlet and compressed air out let
- Bearing housing : it enclosed around it around the turbo charger shaft that contain

SECTION B

Q16 name ten 10 properties of cast iron

- It can be casted to any shape
- It is weak intension but strong in compression
- It has poor ductility
- It has poor malleability
- It offer good resistance bending

- It is belittled metal
- It should be carefully handled to avoid breakage
- It with stand high temperature
- Good heat conductor
- Good electric conductor
- It is easily rust
- It has good wear resistance

Q17a) what are two causes of loss of coolant on the inside engine

- Damaged cylinder head gasket
- Crank on top force of cylinder block
- Incorrect tighten of the cylinder head
- Deformation of the cylinder head engine hot
- Engine hesitation

b. Possible cause of defective head gaskets

- ✓ Over heating of engine
- ✓ High compression ration
- ✓ Incorrect tightening of the cylinder head
- ✓ Use of improper gasket
- ✓ Incorrect installation of cylinder head gasket on the top of cylinder block
- ✓ Un respected manufacture introduction about replacement of cylinder head gasket
- ✓ Crank on top face of cylinder block crank on the bottom force of cylinder block
- ✓ The pressure in cylinder block drop
- ✓ Power loss

Q18. A) sketch of "pintoux nozzles (pintle with auxiliary hole)

b) Give the difference between merits and demerits of pintoux nozzle

Merits of pintoux nozzle	Demerits of pintoux nozzle
Right combustion	High fuel consumption
Good swirl	Excessively high compression ratio
Low unburned gases	High temperature
Increase of engine power	Excessive leak
Low emission	Spray pattern disterted
Assist engine starting from cold	Giving heavy fuel compression
The pressure the fuel is suffcient	
Fuel pressure lift the pintle faster	

19. A) task that can be performed by the delivery valve

- Prevent fuel from running out of the injector pipe when the plunger is on it down words
- To ensure that a residual line pressure is maintained in each injector delivery pipe
- To stop dribbling at end of the injection phase
- Maintain residual pressure constant
- Avoid nozzle dribbling (injector dribbling)
- Increase injection pressure and keep it constant
- Improve engine performance

b) Explain the working principle of delivery valve

- When the plunger delivery fuel in hole transfer hole to delivery valve the fuel accumulate and overcome the spring which hold the delivery valve. Delivery valve raise up at its set and flow to injector after fuel passage the spring extend to press the delivery at its seat against fuel flow from injection pump to injector, activity, restart again.

20. The procedure of relining (replacement) wheel drum brakes

- Park the vehicle on a plane surface
- Wedge the vehicle other to prevent the vehicle from moving forward or backward
- Release the hand brake
- Release all wheel nuts of the concern wheel
- With the jack (hydraulic or mechanical) lift the vehicle
- Use stands to support the vehicle
- Remove all wheel nuts
- Remove wheel and tire assembly and deposit it under the vehicle for security
- Remove brake drum
- Disassembly brake shoes, spring and locks
- Replace the damaged components and start reassembly following the reverse procedures of disassembly

SECTION C

21. A. Give Five objectives that should fulfill consistently and precisely a good injection system for a CI engine are

- Power increase
- Reduction of emission
- Quality regulation of fuel
- Reduction of fuel consumption

- Homogeneous mixture
- Uniform combustion
- Smooth running and operation
- Good thermal efficiency

B) In order to achieve these objectives; what are five main component required for idle injection and the role are:

- Fuel tank: to store the fuel
- Fuel feed pump: supply or pump the fuel from reservoir and delivery to the injection pump
- Fuel flitter: remove the impurities from the fuel
- Injection pump: to pressure rise and regulate the quality of fuel to be injected
- Injection control or governor or IPO concept: control the working the principle pressure of the engine
- Hand pump: remove the bubbles and feed or increase fuel injection pump
- heater plug /glow plug :to heat fuel during the clod start

Q22. A. compute the air flow, fuel flow, specific fuel and air consumption for a four-stroke engine developing 2500Kw at 2000rpm when the stroke volume is 0.07m^3 , $n=0.30$ and $F/A=F_c/A$

B. Compute the indicated and brake mean effective pressure when the mechanical efficiency is 0.8

C. what would be the brake power developed when the efficiency is 0.25, air flow rate 195kg/min and $F/A=0.9 F_c/A$

Give data

$P=2500\text{kw}$

a. Unknown

$N= 2000\text{rpm}$

air flow=?

$V= 0.07\text{m}^3$

fuel flow=?

$\Lambda= 0.30$

specific fuel=?

$F/a=f_c/a$

air consumption=?

Mechanical efficiency = 0.8

Efficiency developed power=0.25 b. Effective pressure=?

Q=195kg/min

c. Brake power

F/a=0.9fc/a

Answer/

A. $M_f = P / H_v \times \lambda = 2500 \times 60 / 40.000 \times 0.3 = 12.5 \text{ kg/min}$

Since $f_c/a = f/a$ and $m_a/m_f = 15$; $m_a = 15 \times 12.5 = 187.5 \text{ kg/min}$

And SFC = $12.5 \times 60 / 2500 = 0.3 \text{ kg/Kwh}$

$S_{ac} = 0.3 \times 15 = 4.5 \text{ kg/kwh}$

B. Brake main effective pressure (B.meffp) = $P \times 2 \times 60 / V_s \times N$

= $2500 \times 2 \times 60 / 0.07 \times 200 = 2142.9 \text{ kpa}$

Indicated mean effective pressure (ind.meffp) = $b_{meffp} / \lambda_{mech}$

$2142.9 / 0.8 = 2678.6 \text{ kpa}$

C. Actual air fuel ratio = $15 / 0.9 = 16.67$

. Actual $m_a = 195 \text{ kg/min}$

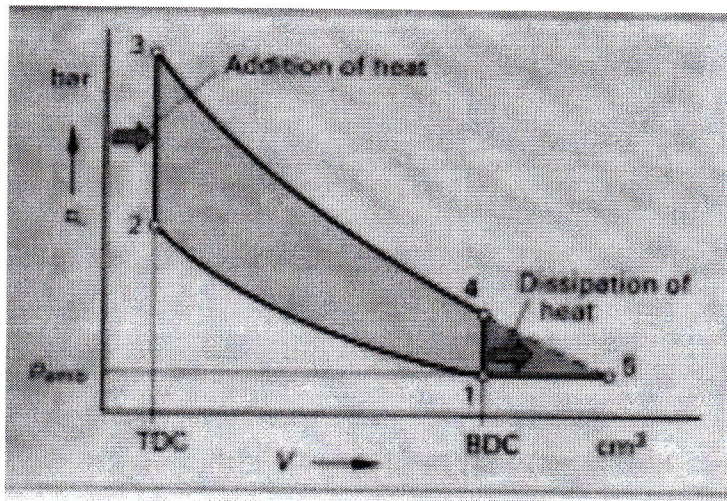
Actual $m_f = 195 / 16.67 = 11.7 \text{ kg/min}$

Heat in put to the engine per min = $M_f \times H_v$

Brake power = heat in put x efficiency of brake power

= $11.7 \times 40000 / 60 \times 0.25 = 1950 \text{ kw}$

Q23. A. A. In order to obtain a better analysis of the actual working cycles, it is essential that we consider the physical properties of the actual working fluid before and after combustions. List 10 assumptions made in the analysis of fuel-air cycles



- Compression: all valves (inlet and exhaust) are closed, piston moves from BDC to TDC compress mixture volume decrease, pressure increase
- Power: all valve (inlet and exhaust) closed pressure constant, volume constant temperature increase, piston moves from TDC to BDC
- Exhaust: exhaust valve is open, volume decrease, pressure decrease, temperature decrease piston moves from BDC to TDC
- B. define scavenging in two stroke engine and list the assumptions made in the two scavenging models. Induction: inlet valve open fuel air mixture enters in cylinder volume increase; pressure decrease piston moves from TDC to BDC
- When the piston move down, fuel air mixture entering or induct in the crank case (induction and pre compression) piston moves up from BDC open passage transfer port) fuel air mixture transported in the combustion chamber (main compression) piston close transfer port fuel air mixture burned and push the piston down ward (power stroke at the same time exhaust stroke)open exhaust at the same time transfer port still open fresh air transferrin the comber chamber to clean chamber
Briefly: scavenging means that both transfer port and exhaust port must be open. Compere with valve over lap at four stroke engine

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SECTION A