
Define the following w.r.to. I.C. engine.

(i) Indicated Power: The total power developed by combustion of fuel in the combustion chamber is called indicated power.

(ii) Brake Power: The power developed by an engine at the output shaft is called brake power.

(iii) Volumetric efficiency: It is defined as the ratio of the actual volume of the charge admitted into the cylinder to the swept volume of the piston is known as volumetric efficiency.

(iv) **Brake specific fuel consumption:** It is the mass of fuel consumed per kw developed per hour, and is a criterion of economical

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State the advantages of closed cycle gas turbine over open cycle gas turbine

Advantages of closed cycle gas turbine over open cycle gas turbine: (i) It has higher thermal efficiency for the same minimum and maximum temperature limits and for the same pressure ratio. (ii) Since the heating is external, any kind of fuel even solid fuel having low calorific value may be used. (iii) There is no corrosion due to circulation of combustion product. (iv) As the system is a closed one there is no loss of the working fluid. (v) The size of the turbine will be

smaller compared to an open cycle gas turbine of the same output.

Turbojet engine working principle

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State the advantages of lubricant additives (any four)....

Additives (1) Detergents – To keep engine parts, such as piston and piston rings, clean & free from deposits. (2) Dispersants – To suspend & disperse material that could form varnishes, sludge etc that clog the engine. (3) Anti – wear – To give added strength & prevent wear of heavily loaded surfaces such as crank shaft rods & main bearings. (4) Corrosion inhibitors – To fight the rust wear caused by acids moisture. Protect vital steel & iron parts from rust & corrosion.

Differentiate supercharging and turbocharging in I.C. engine.

Difference between Turbocharger and Supercharger

S.no	Turbocharging	Supercharging
1.	Turbocharger is a forced induction system that compresses the atmospheric gases and sends it to the engine cylinder.	Super charger is also a forced induction system. It compresses the atmospheric air and sends it to the engine cylinder.
2.	It uses exhaust gases for its energy.	It is connected to the crankshaft of the engine for its energy.
3.	It is not directly connected to the engine.	It is directly connected to the engine through belt.
4.	It has smog altering equipment which helps in lowering the carbon emission.	It doesn't have waste gate, so the smog emits from the supercharger.
5.	It spins with a speed up to 150000 rpm.	It spins with a speed upto 50000 rpm.
6.	It is much quieter than supercharger.	It is not so quieter.
7.	It is less reliable.	It is more reliable.
8.	Maintenance is not easy.	Maintenance is easy.
9.	Turbocharger delivers their boost better at high rpm.	Supercharger can deliver their boost at lower rpm.
10.	It is more efficient.	It is less efficient.
11.	The compressed air in turbocharger has high temperature.	The compressed air in supercharger has less temperature.
12.	It requires intercooler for the compressed air to lower its temperature.	It may or may not require intercooler. Bu in some types, it requires intercooler.
13.	It is more complex.	It is less complex.
14.	It has lag problem due to discontinuous supply of energy.	It has negligible lag problem because of continuous supply of energy by crankshaft.
15.	The compressor is rotated by the turbine.	The compressor is rotated by the engine crankshaft through a belt.

Explain MPFI with neat sketch.

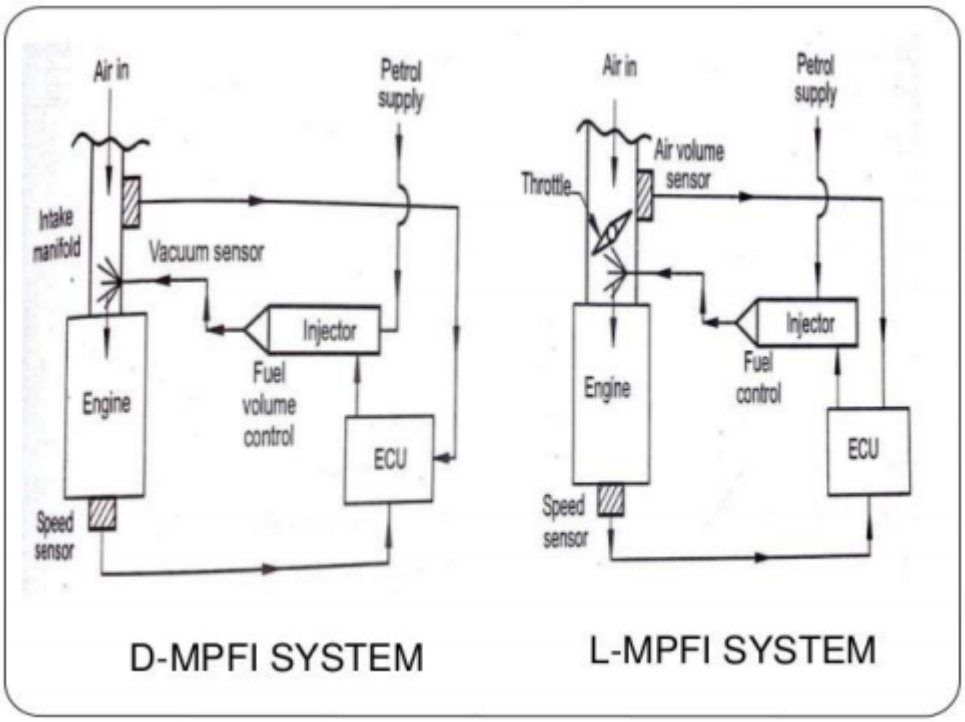
Attempt any FOUR MPFI : MPFI means Multipoint Injection System in which each cylinder has number of injector to supply / spray the fuel in cylinders.

- The MPFI electronic system is also classified as

1) D-MPFI system: The main input signal are the intake manifold pressure, Engine speed and flow volume of air which are sent to ECU to control the A/F ratio.
2) L-MPFI system: The main input signal are air flow rate and engine speed to regulate fuel quantity injected.

- The both system mentioned above, sends the information of respective sensors to ECU and then ECU processes the information and sends commend to fuel injector to regulate fuel injected. Then the mixture formed enters into the engine.

MPFI result in 1. Superior fuel consumption, 2.Better fuel management, 3.Better engine performance, 4. Reduce pollution.



The following results were obtained during Morse test on 4-stroke petrol engine....

B.P. developed when all cylinders working = 16.2 kW

I.P. of first cylinder $I.P_1 = 16.2 - 11.5 = 4.7$ kW

— " — second — " — $I.P_2 = 16.2 - 11.6 = 4.6$ kW

— " — third — " — $I.P_3 = 16.2 - 11.68 = 4.52$ kW

— " — fourth — " — $I.P_4 = 16.2 - 11.57 = 4.63$ kW

(1 mark each)

Total $I.P. = I.P_1 + I.P_2 + I.P_3 + I.P_4$

$= 4.7 + 4.6 + 4.52 + 4.63$

$= 18.45$ kW (2 marks)

$\eta_{mechanical} = \frac{B.P.}{I.P.}$

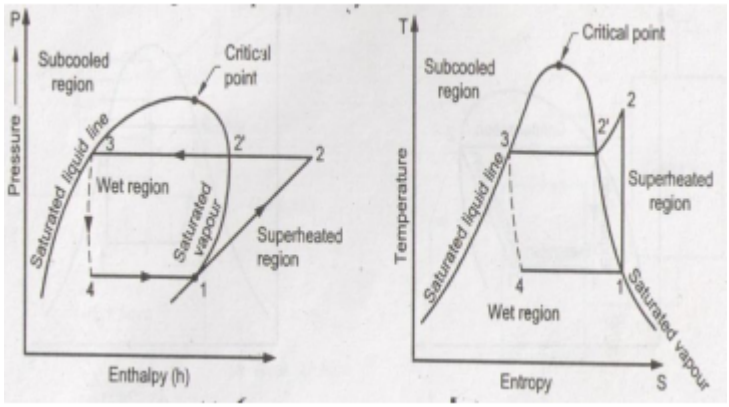
$= \frac{16.2}{18.45}$

$= 87.8\%$ (2 marks)

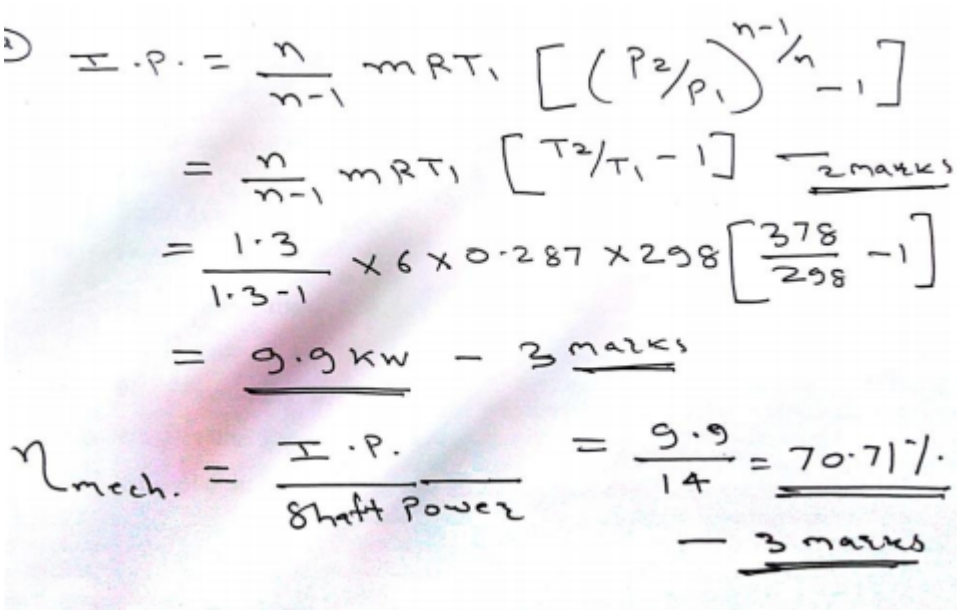
FP = IP – BP= 18.45-16.2 = 2.25 KW.

Explain vapour compression refrigeration cycle on T-S and p-h charts..

Vapour Compression Refrigeration Cycle

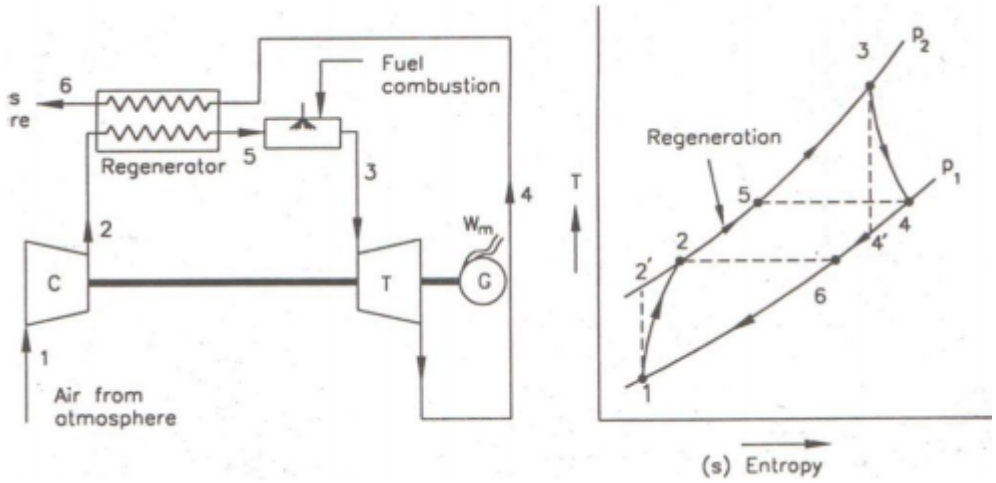


Reciprocating air compressor draws 6 kg of air per minute at 25°C. It compresses the air....



Explain regeneration method to improve thermal efficiency of gas turbine with the help...

Regenerative method to improve thermal efficiency in gas turbines : The exhaust gases a lot of heat as their temperature is far above the ambient temperature . The heat of exhaust gases can be used to heat the air coming from the compressor thus reducing the mass of the fuel supplied in the combustion chamber as shown in the figure. This method is called regenerative method.



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