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Explain with neat sketch working principle of turbo jet engine.

Working principle of Turbojet: shows the schematic of turbojet engine. It has a diffuser section at inlet for realizing some compression of air passing through this section. Due to this air reaching compressor section has pressure more than ambient pressure. This action of partly compressing air by passing it through diffuser section is called “ramming action” or “ram effect”. Subsequently compressor section compresses air which is fed to combustion chamber and fuel is added to it for causing combustion.

Define : i) Isothermal efficiency.

i) Isothermal efficiency – It is defined as the ratio of isothermal power to the indicated or actual power. Isothermal efficiency = Isothermal power / Indicated power.

ii) Volumetric efficiency – It is the ratio of actual volume of the free air delivered at standard atmospheric condition at discharge in one delivery stroke to the swept volume by the piston during the stroke.

State any four types of sensors used in I.C. engine.

Following sensors are used in ECU: A permanent magnet inductive signal generator is mounted in close proximity to the flywheel, where it radiates a magnetic field. As the flywheel spins and the pins are rotated in the magnetic field, an alternating (AC) waveform is delivered to the ECM to indicate speed of rotation.

State advantages of jet propulsion over other systems.

Advantages of jet propulsion – 1. Higher mechanical efficiency due to absence of reciprocating parts. 2. The weight of gas turbine per kW power developed is low since the working pressures are low requiring lighter construction. 3. Can produce much more power at much higher altitudes where drag is less so higher speeds are possible and they are more efficient. 4. Reliability is one of the elements of success for jet engines. They only have a couple of moving parts and almost no vibration.

State advantages of closed cycle gas turbine.

Advantages of closed 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.

Define : i) Mechanical efficiency ii) Volumetric efficiency related to I.C. engine.

i) Mechanical Efficiency- It is the ratio of the power available at the engine crankshaft (bp) to the power developed in the engine cylinder (ip).

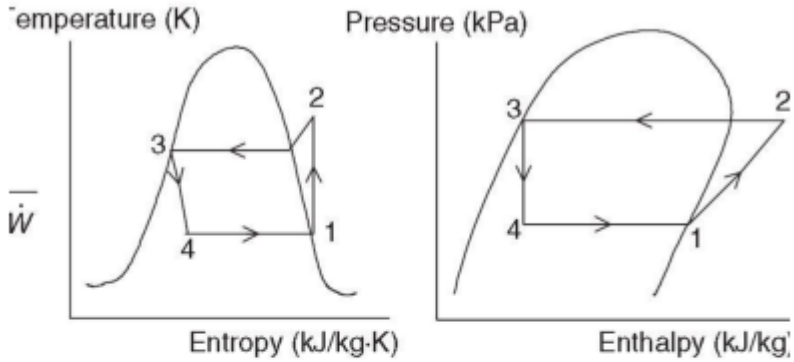
ii) Volumetric efficiency :- It is the ratio of the actual volume of the charge admitted into the cylinder to the swept volume of the piston .

What are the effects of detonation in I.C. engine ?

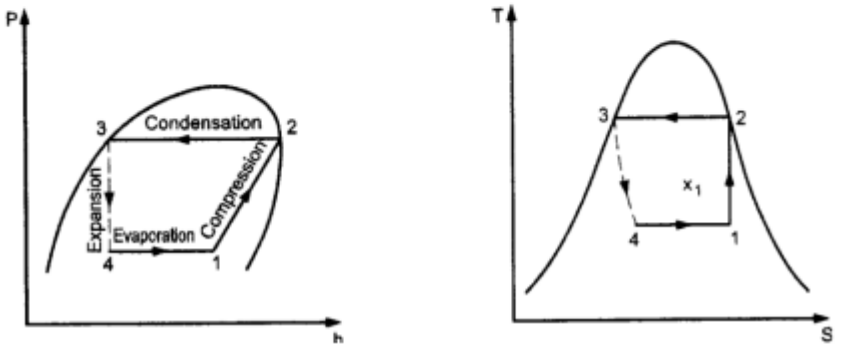
Effects of detonation (1) Noise – As intensity of detonation increases, the sound intensity increases & it is harmful. (2) Mechanical damage – shock waves are so violent that it may cause mechanical damage like breaking of piston. It increases the rate of wear erosion of piston. (3) Pre-ignition – Due to local overheating of spark plug & this pre-ignition increases detonation. (4) Power output & efficiency decreases - Power output & thermal efficiency decreases due to abnormal combustion.

Represent wet compression and dry compression on

Dry Compression



Wet Compression -



Explain with neat sketch working principle of Ram jet engine

Ramjet has no compressor as the entire compression depends upon compression. Function of supersonic & subsonic difference to convert the kinetic called the ram pressure.

State effects of pollutants in exhaust gases of petrol engine.

The major air pollutants emitted by petrol engines are CO2, CO, HC, NOx, SO2, smoke & lead vapour.

Effect of CO:

Carbon monoxide combines with hemoglobin forming carboy hemoglobin, which reduces oxygen carrying capacity of blood.

1. This leads to laziness, exhaustion of body & headache. 2. Prolong exposure can even leads to death. 3. It also affects cardiovascular system, thereby causing heart problem

Effect of CO2: Causes respiratory disorder & suffocation.

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