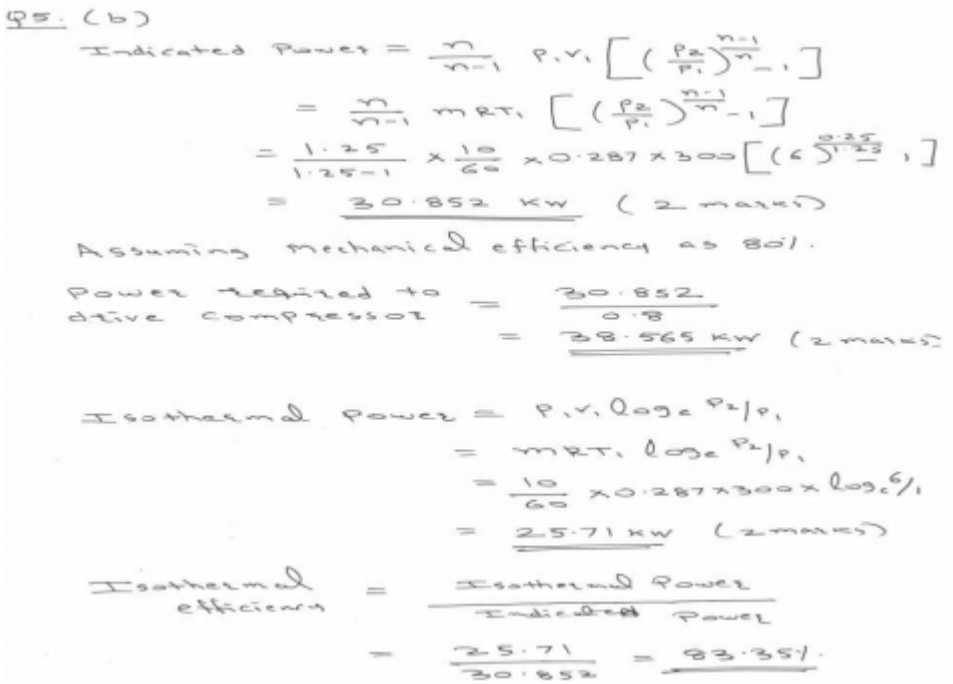

A pneumatic rock drill requires 10 kg/min of air at 6 bar pressure....



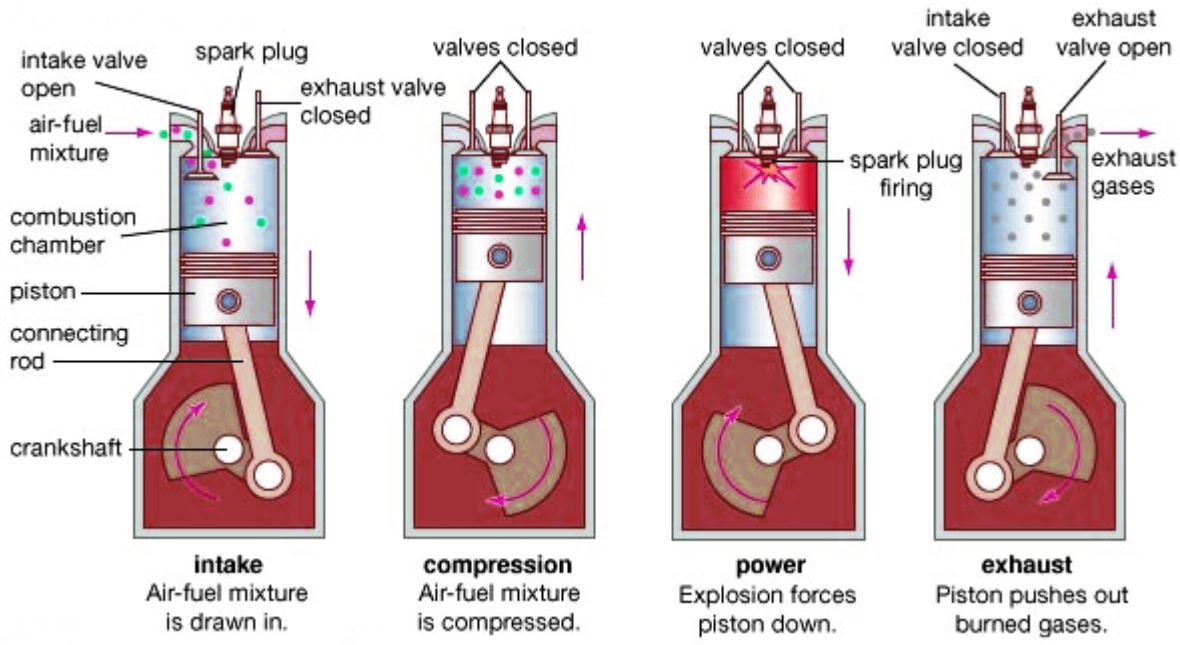
Explain construction and working of ice plant with neat sketch.

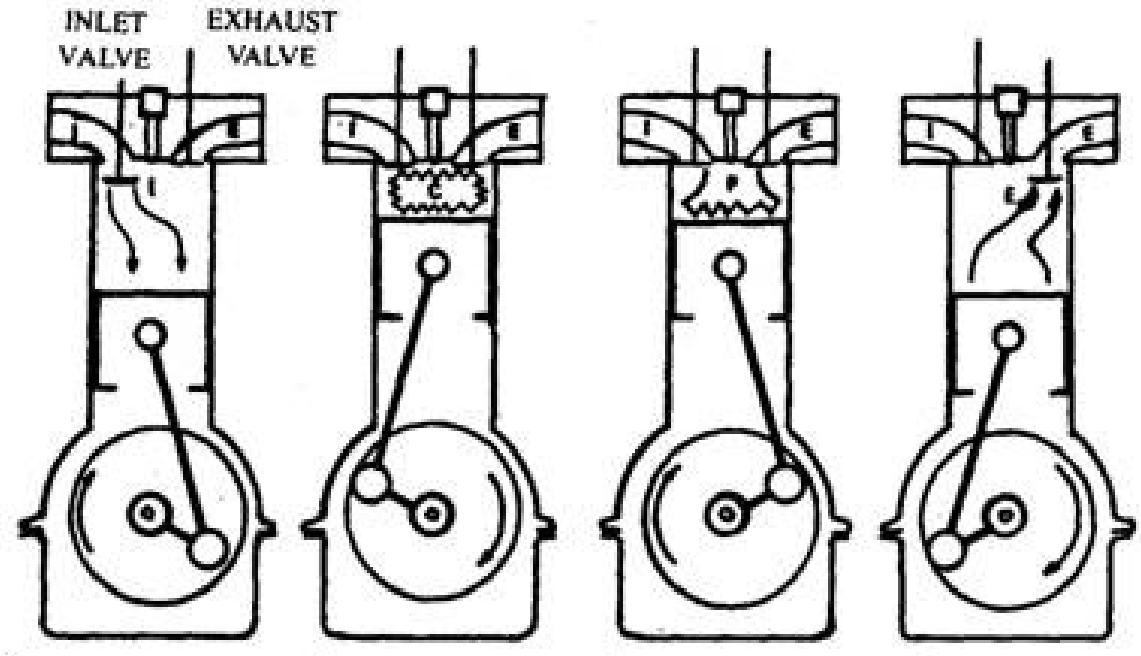
The main cycle used for ice plant is vapor compression cycle with ammonia as the refrigerant in primary circuit and brine solution in secondary circuit. Brine solution takes heat from water in secondary circuit and delivers the heat to ammonia in primary circuit. Thus, the indirect method of cooling is used in ice plant. In secondary circuit brine is cooled in evaporator and then it is circulated around the can

which contains water. The heat is extracted from the water in the can and is given to the brine.

With neat sketches explain the working principle of four stroke spark ignition engine.

Four stroke spark ignition engine working principle





List the additives of Lubricant used in S.I. engine and state their advantages.

Role of following lubricant additives (one mark each) 1. Zinc ditinophosphate: - Zinc ditinophosphate serves as an anti – oxidant and anticorrosive additive.

2. Fatty acids: - This type of additives prevents rusting of ferrous engine parts during and form acidic moisture accumulation during cold engine operation.

3. Organic Acids: - This type of additives improves the detergent action of lubricating oil.

4. Ester: - To lower the pour point of lubricating oil.

5. Silicon polymers: - This additive serves as Antifoam Agent.

Describe the method to measure indicated power of I.C. engine.

Method to measure Indicated power :

Indicated Power :

The power developed inside the engine cylinder is known as indicated power and denoted by I.P.

Measurement of indicated power :

Indicated power of engine at a particular speed can be calculated with the help of indicator. The indicator is fitted to the engine cylinder.

The strength of the spring to be used in the indicator must be carefully chosen.

The ratio of maximum pressure in the engine cylinder to the mean pressure during the cycle in an I.C. engine is much greater than that of any other heat engine.

The variation of pressure inside the engine cylinder is obtained an a diagram called as indicator diagram as shown in Fig.

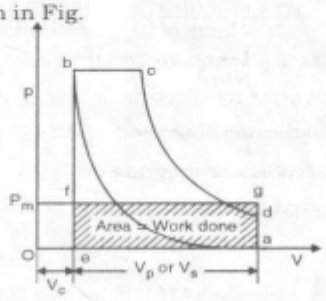


Fig. 2.1

The diagram obtained is a curved abcd the area under the curve is workdone as shown in P-V diagram work obtained = A (a – b – c – d).

Area (a b c d) into rectangle of length equal to stroke volume as shown in Fig. 2.1.

$$A(a-b-c-d) = A(a-e-f-g)$$

Consider height of rectangle as mean effective pressure (P_m)

∴ Average variation of pressure inside engine cylinder equal to P_m

$$\text{work/cycle} = A(a-b-c-d) = A(a-e-f-g) = P_m V_s$$

$$= P_m A \times L$$

$$= P_m \times \frac{\pi}{4} d^2 L$$

$$\text{Indicated power} = \text{workdone/cycle} \times N$$

$$= P_m A L N$$

Where N is speed of engine then N number of power stroke or explosion.

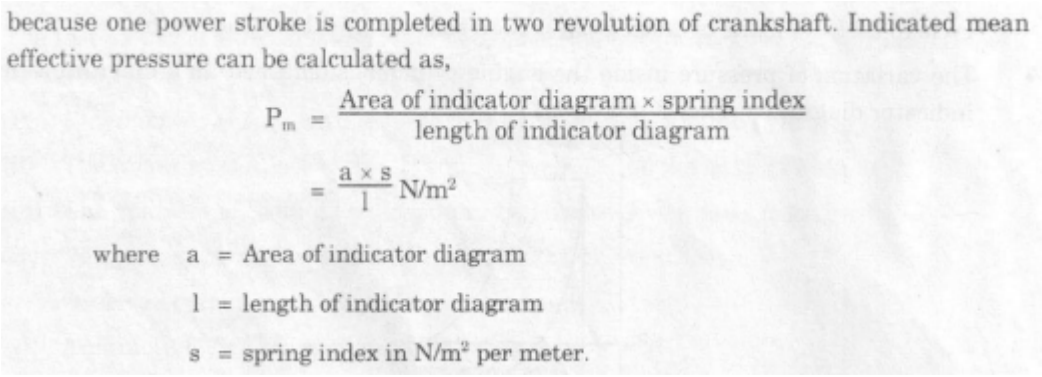
a) For two stroke engine

$$I.P. = P_m A L N$$

b) For four stroke engine

$$I.P. = P_m A L \times \frac{N}{2}$$

$$N = \frac{N}{2}$$



because one power stroke is completed in two revolution of crankshaft. Indicated mean effective pressure can be calculated as,

$$P_m = \frac{\text{Area of indicator diagram} \times \text{spring index}}{\text{length of indicator diagram}}$$

$$= \frac{a \times s}{l} \text{ N/m}^2$$

where a = Area of indicator diagram

l = length of indicator diagram

s = spring index in N/m^2 per meter.

Draw and explain Battery ignition system.

Battery Ignition system : I t consists of six or twelve volt battery, ignition switch,induction coil, circuit breaker condenser and distributor. All the circuit parts are shown in figure. One terminal of battery is ground to engine frame and other is connected through the ignition switch to one primary terminal of induction coil. The other primary connection is connected to one end of contact point of circuit breaker and through closed points to ground. The ignition switchis made on and engine is crancked. When the contacts touch, the current flows the battery to the switch.

Define the following related I.C. engine

i) Indicated Power (ip) is defined as the power developed by combustion of fuel in the cylinder of engine. It is always more than brake power. ii Brake Power:- □ The useful power which is available at the crank shaft is called as brake power. □ It is denoted by “B.P.” □ It has unit kW iii) B.S.F.C: It is the weight of fuel required to develop 1KW of the brake power for period of 1 hour. Unit of B.S.F.C is Kg/KWh. It is defined as the amount of fuel consumed per unit of

break power developed per hour.

Explain MPFI system with sketch

MPFI system :

The MPFI system is a port fuel-injection system in which, fuel metering is regulated by the engine speed and the amount of air which actually enters the engine. This is called air-mass metering or air-flow metering.

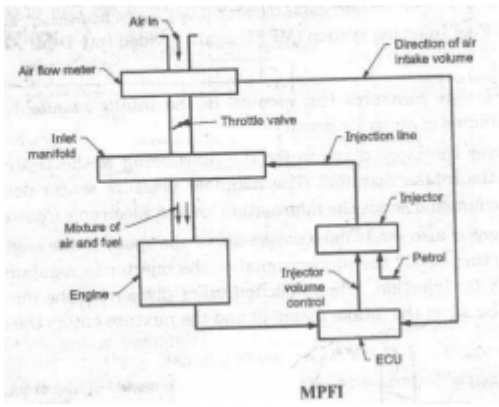
The block diagram of an MPFI system explaining its functioning is shown in Fig.

After the air enters into the intake manifold, the air-flow sensor measures the amount of air that enters into the intake.

The air-flow sensor sends the information of the air-flow meter to the ECU. Similarly, the speed sensor sends information about the speed of the engine to the ECU.

The ECU processes the information received and sends the proper signal to the injector, in order to regulate the amount of petrol supply for injection.

When injection takes place from the injector, the petrol mixes with the air in the intake manifold and the mixture enters the cylinder.



MPFI

Explain different stages of combustion in C.I. engine with sketch.

1) Ignition delay period : During this fuel has already admitted but has not yer ignited. This is counted from start of injection to the point where P-O curve separates from pure air compression curve. 2) Rapid or uncontrolled combustion : In this stage pressure rise because of during the delay period the fuel droplet have time to spread over a

wide area and fresh air around them.

Name the different sensors used in ECU of modern automobile with their application....

Crank angle sensor: 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.

Air Flow Sensor (AFS): The AFS is normally located between the air filter and the throttle body. As air flows through the sensor, it deflects a vane (flap) which wipes a potentiometer resistance track and so varies the resistance of the track and generates a variable voltage signal.

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