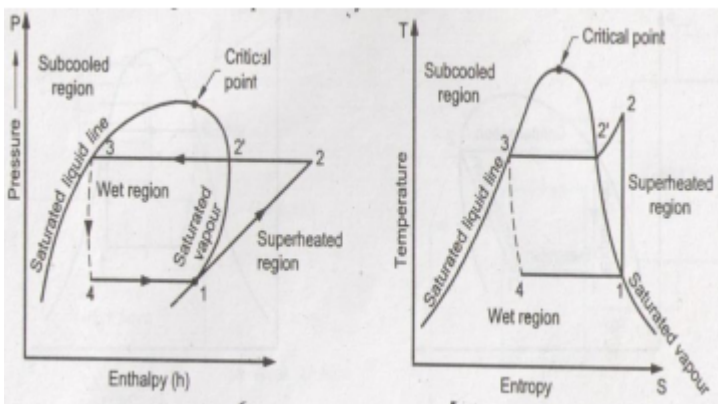


Explain vapour compression refrigeration cycle on T-S and p-h charts..

Vapour Compression Refrigeration Cycle

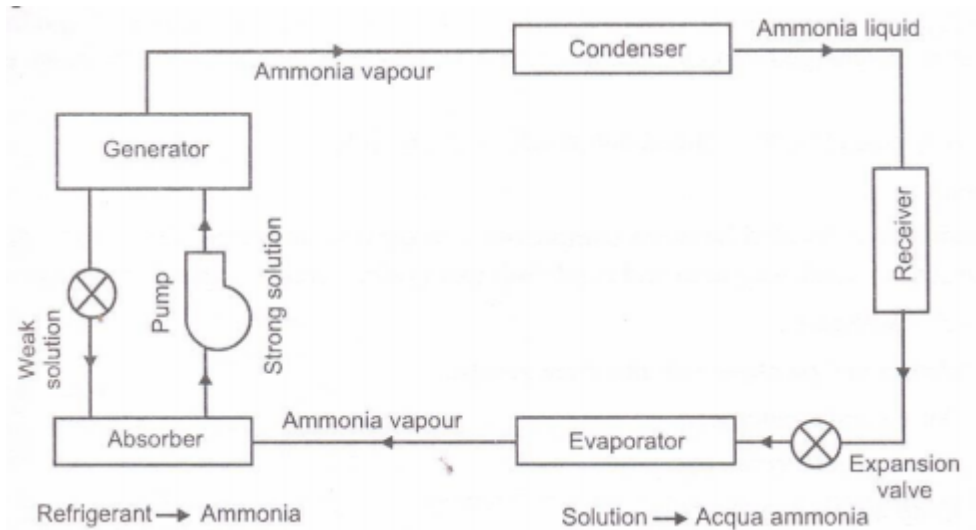


Explain the working of simple vapour absorption refrigeration system.

## **Vapour absorption refrigeration system**

vapour absorption refrigeration system is an energy efficient system of achieving refrigeration effect.

Vapor absorption refrigeration system is schematically demonstrated in following diagram.

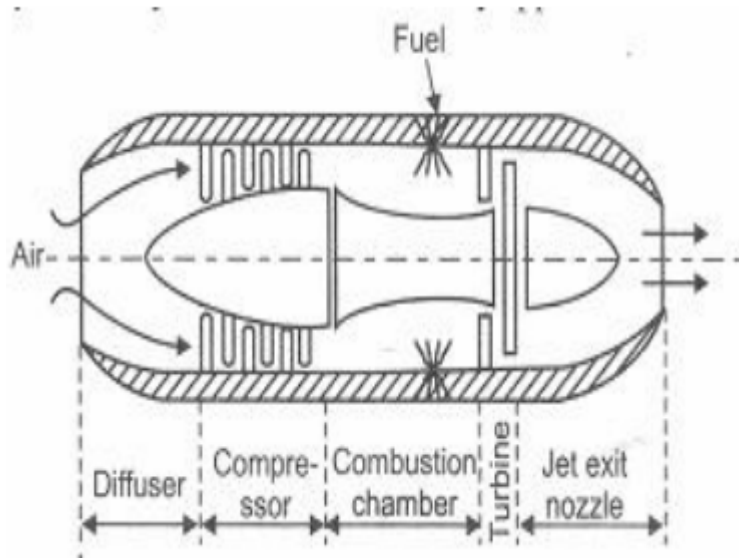


Define : i) WBT ii) DPT.

i) WBT: Wet bulb Temperature  $t_{wb}$  : It is the temperature recorded by a thermometer when its bulb is covered by a wet cloth exposed to the air. ii) DPT: Dew point temperature  $t_{dp}$  : It is the temperature of air recorded by thermometer, when the moisture (water vapour) present in it, begins to condense. iii) DBT: Dry Bulb Temperature  $t_{db}$  : It is the temperature of air recorded by ordinary thermometer with a clean, dry sensing element .

Draw the schematic diagram of turbojet engine.....

Turbo Jet Engine



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What is the necessity of purification of air ? How to remove oil, moisture and dust from air.....

The air sucked by the compressor is not clean. It contains various types of solid, liquid and gaseous contaminants such as dust, dirt, moisture etc. The presence of contaminants may have high damaging effects such as corrosion, wear and tear on the finely finished mating surfaces of pneumatic components. Air lines may get choked or damaged. Therefore, purification of air by removing oil, moisture and dust is done to protect the pneumatic system from failure, so that the system should work efficiently.

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

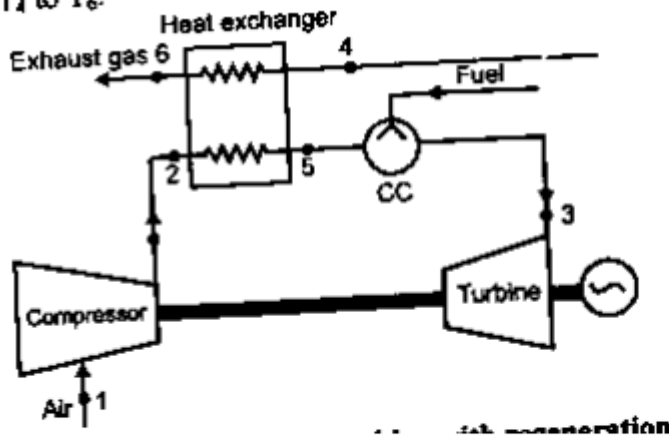
Brake Power Engine (BP)engine = 16.2 kW Brake Power developed when 1st Cylinder cut-off ( BP )<sub>2,3,4</sub> = 11.5 kW Brake Power

developed when 2nd Cylinder cut-off ( BP )<sub>1,3,4</sub> = 11.6 kW Brake  
 Power developed when 3 rdCylinder cut-off ( BP )<sub>1,2,4</sub> = 11.68 kW  
 Brake Power developed when 4 thCylinder cut-off ( BP )<sub>1,2,3</sub> = 11.5  
 kW Indicated Power of 1st cylinder  $IP_1 = (BP)_{\text{engine}} - (BP)_{2,3,4} =$   
 $16.2 - 11.5 = 4.7 \text{ kW}$   $IP_2 = (BP)_{\text{engine}} - (BP)_{1,3,4} = 16.2 - 11.6 =$   
 $4.6 \text{ kW}$   $IP_3 = (BP)_{\text{engine}} - (BP)_{1,3,4} = 16.2 - 11.68 = 4.52 \text{ kW}$   $IP_4 =$   
 $(BP)_{\text{engine}} - (BP)_{1,2,3} = 16.2 - 11.5 = 4.7 \text{ kW}$  Indicated Power of  
 Engine

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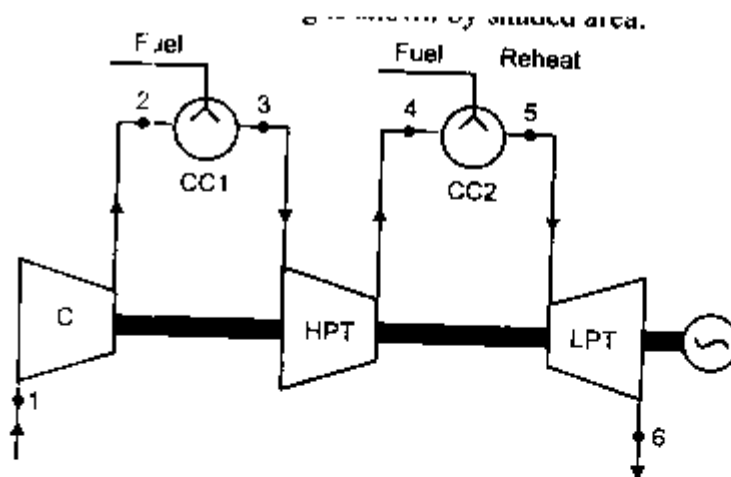
State the methods used to improve thermal efficiency of gas turbine and explain any one.

Methods to improve thermal efficiency of gas turbine Regeneration -  
 This is done by preheating the compressed air before entering to the  
 combustion chamber with the turbine exhaust in a heat exchanger,  
 thus saving fuel consumption..



2) Improving turbine output: this can be done by

(a) **Reheating** : The whole expansion in the turbine is achieved in two or more stages & reheating is done after each stage.

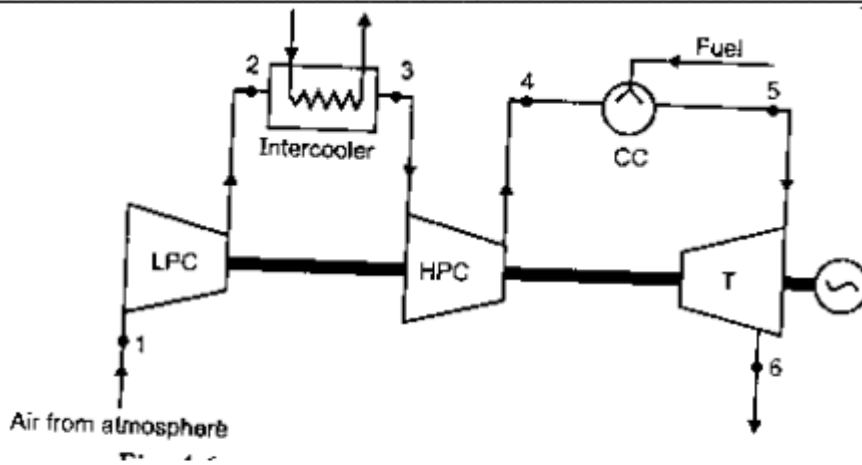


(b) Increasing the value of maximum cycle temp.

(c) Improving turbine efficiency by improving design.

3. Reducing compressor input: By

(a) **Intercooling** : Compressor work is reduced by intercooling the air between the compressor stages.



- (b) By lowering inlet temp to compressor
- (c) By increasing compressor efficiency
- (d) Water injection at inlet to compressor

## Four Stroke petrol engine

### Four Stroke petrol engine

FOUR STROKE PETROL ENGINE refers to its use in petrol engines, gas engines, light, oil engine and heavy oil engines in which the mixture of air fuel are drawn in the engine cylinder. Since ignition in these engines is due to a spark, therefore they are also called spark ignition engines. In four stroke cycle engine, cycle is completed in two revolutions of crank shaft or four strokes of the piston. Each stroke consists of 180° of crankshaft rotation. Therefore, the cycle consists of 720° of crankshaft rotation.

Explain the working of two stage reciprocating compressor.....

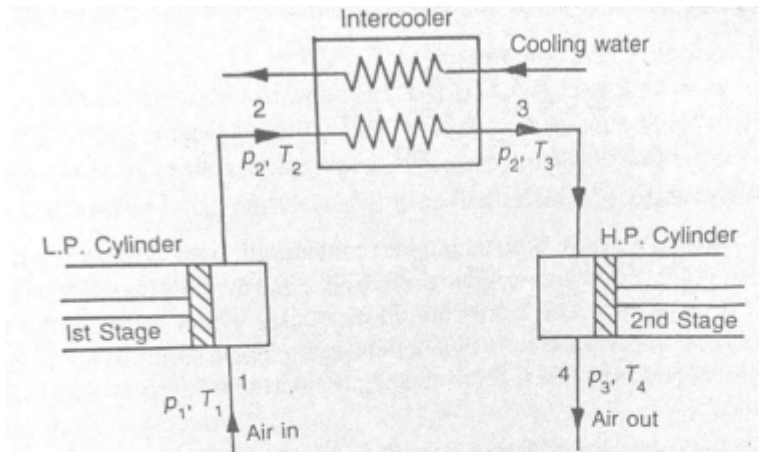
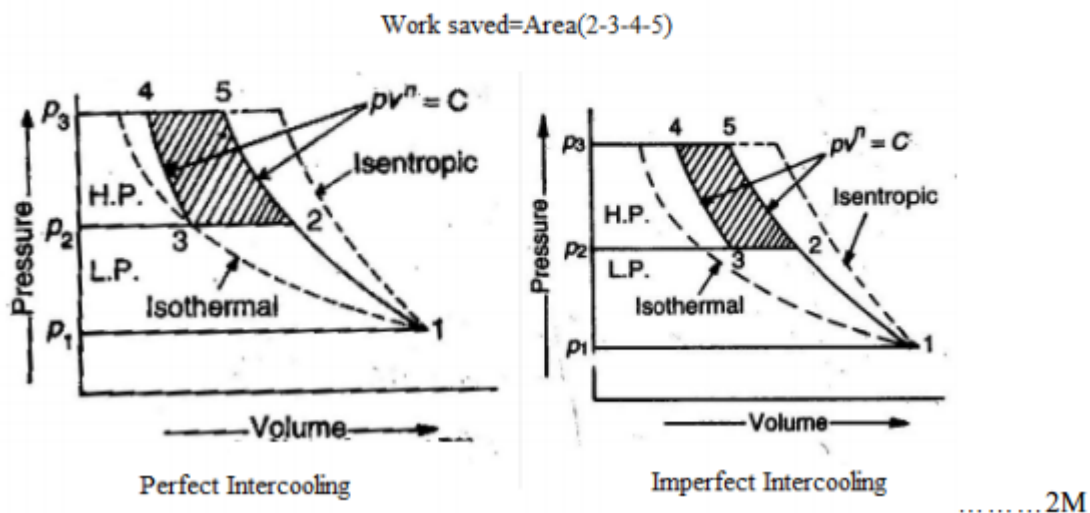


Fig. Two stage reciprocating air compressor.....2M

Working:- Let  $P_1, V_1$  be the pressure and volume of air entering the low pressure cylinder  $P_2, V_2$  be the pressure and volume of air leaving the low pressure cylinder or pressure and volume of air entering the intercooler  $P_3, V_3$  be the pressure and volume of air entering the high pressure cylinder  $P_4, V_4$  be the pressure and volume of air leaving the stage and 'n' be the index of compression (As suitable). ....2M



Explain how the heat balance sheet for an IC engine is prepared.....

i) Heat Balance Sheet :-The complete record of heat supplied and heat rejected during a certain time (Say one minute) by an IC engine is entered in a tabulated form called as heat balance sheet. i) Heat supplied by the fuel =  $M_f \times C$  where  $M_f$  = mass of fuel supplied in Kg/min  $C$  = Lower calorific value of fuel kJ/kg

ii) Heat absorbed in IP produced

we know that IP produced by IC engine is

$$IP = \frac{100P_m L A n}{60} \dots \dots \dots \text{kwatt}$$

$$\text{Heat absorbed in IP} = 100P_m L A n \dots \dots \dots \text{kJ/minute} \dots \dots \dots 1M$$

iii) Heat rejected to the cooling water

The mass of cooling water, circulating through the cylinder Jackets, as well as its inlet and outlet temperatures are measured in order to determine heat rejected to cooling water.

$$\text{Heat rejected to cooling water} = m_w C_w (t_1 - t_2) \dots \text{kJ/minute} \dots \dots \dots 1M$$

Where,

$m_w$  = Mass of cooling water supplied in kg/min

$C_w$  = specific heat of water

$t_1$  = Inlet temperature

$t_2$  = Outlet temperature

$$\text{iv) Heat carried away by exhaust gases} = m_g C_g t \dots \dots \dots \text{kJ/min} \dots \dots \dots 1M$$

Where,

$m_g$  = Mass of exhaust gasses produced in kg/min

$C_g$  = specific heat exhaust gases

$t$  = Rise in temperature

v) Un accounted Heat= It is the difference of Heat supplied by the fuel and Heat absorbed in IP produced, Heat rejected to cooling water , Heat carried away by exhaust gases. .... 1M

Table..... 1M

Sr No	Particulars	Heat In	
		Kj	%
	Total Heat Supplied	.....	100
1	Heat absorbed in IP produced		

2	Heat rejected to cooling water		
3	Heat carried away by exhaust gases		
4	Un accounted Heat		



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