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Power Engineering Notes-diploma engineering

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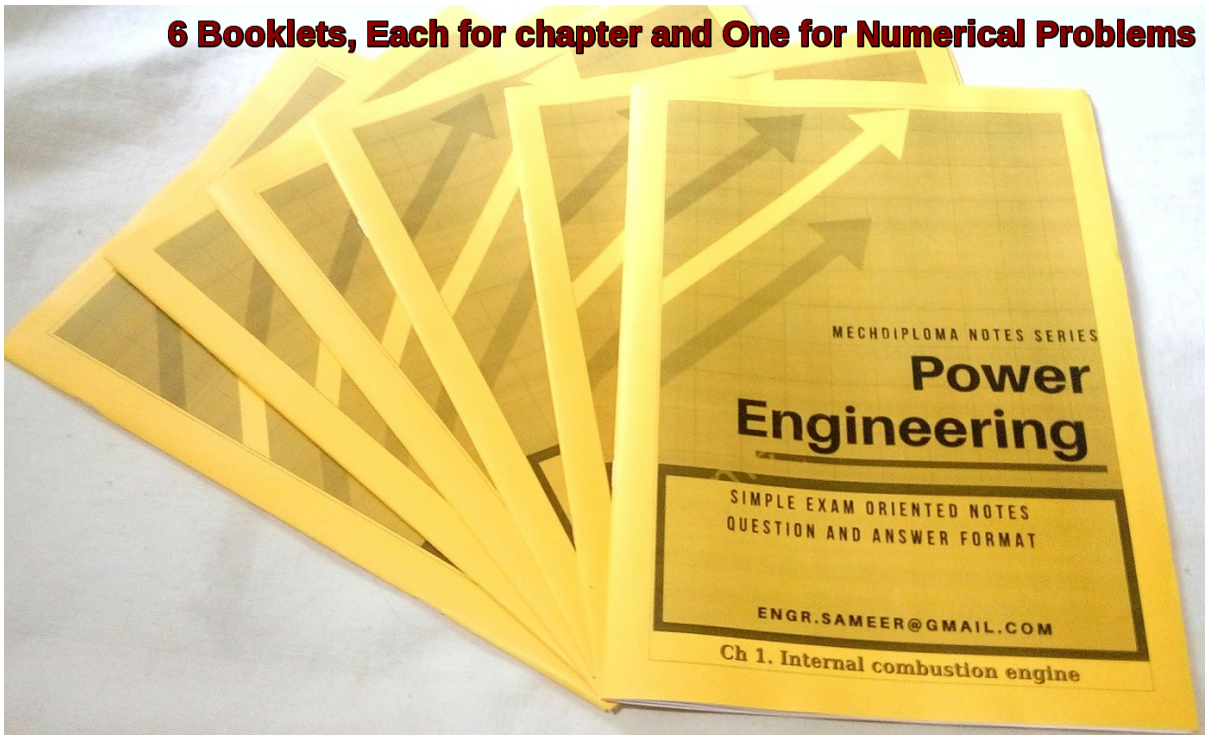
Power engineering notes-diploma engineering is prepared to meet the requirements of diploma students. The semester pattern makes it difficult to read the reference books. So students have to prepare in very short time. Notes are prepared in question and answer format. So that students get exact material for prepreation. It saves lot of time in searching various books and answer sheets.



Following are the salient features of these notes

1. Simple question and answer format.
2. Answers written in most easy english language.
3. Exact answers of the asked questions, without unnecessary description.
4. Covers all points in syllabus. Also questions asked in recent exams.
5. Simple and easy to remember formulas for the numerical problems.
6. Numerical problems arranged from simpler to toughter for getting confidence in solving.
7. po notes-diploma engineering contain easy to reproduce diagrams.
8. Since the paper checking is done on the basis of keywords, in notes keywords are UNDERLINED.

Screenshots from the Notes

As shown in screen shot below the notes provide exact definitions with the underlined keywords.

Q:3. Define the following terms related to compressor

1) Pressure ratio(compression ratio) 2) FAD (free air delivered) 3) Displacement of Compressor 4) Compressor capacity

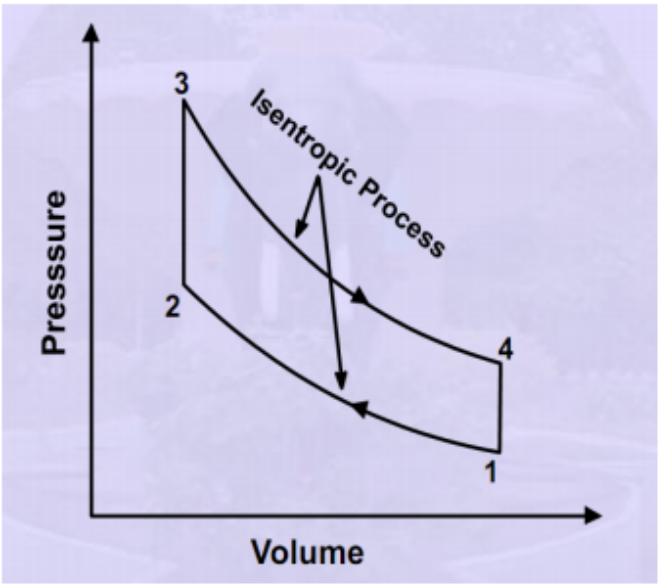
Ans:

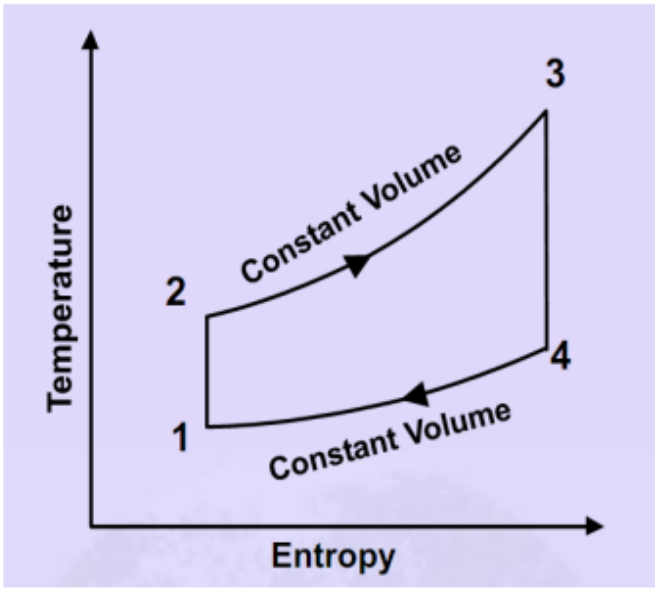
- Compression ratio is defined as the ratio of the absolute discharge pressure to the absolute inlet pressure.
- Free air delivered is the volume of air delivered under the intake condition of temperature and pressure.
- The displacement of compressor is defined as the volume swept through by the first stage piston in cubic meter per minute.
- Capacity of the compressor is defined as the volume of air delivered by the compressor in cubic meter per minute.

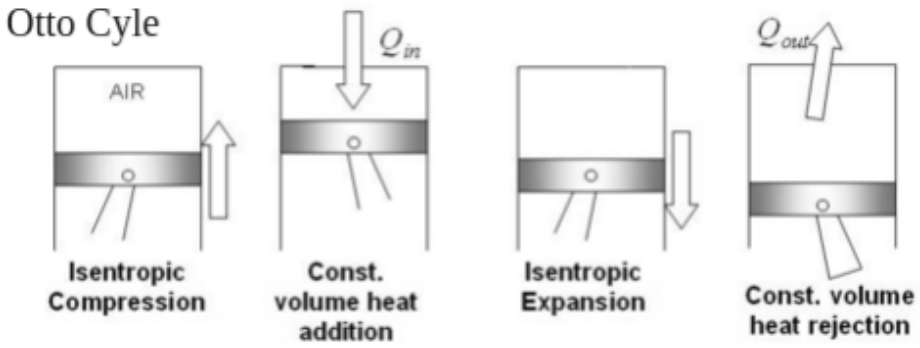
As shown below the diagrams in the notes are easy to draw. As compared to the diagrams in different textbooks.

Q.3) Draw Otto Cycle on PV and TS diagram?Write formula for its efficiency.

Ans :







The air-standard-Otto cycles is the idealized cycle for the spark-ignition internal combustion engines (SI engines or Petrol Engines).This cycles is shown above on P-V and T-S diagrams.

This cycle is also named as 'Constant Volume Cycle' because heat addition and rejection taees place at constant volume. .The Otto cycle 1-2-3-4 consist of following four process :

Process 1-2 ; Reversible adiabatic compression of air

Process 2-3: Heat addition at constant volume

Process 3-4 : Reversible adiabatic expansion of air

Process 4-1 : Heat rejection at constant volume

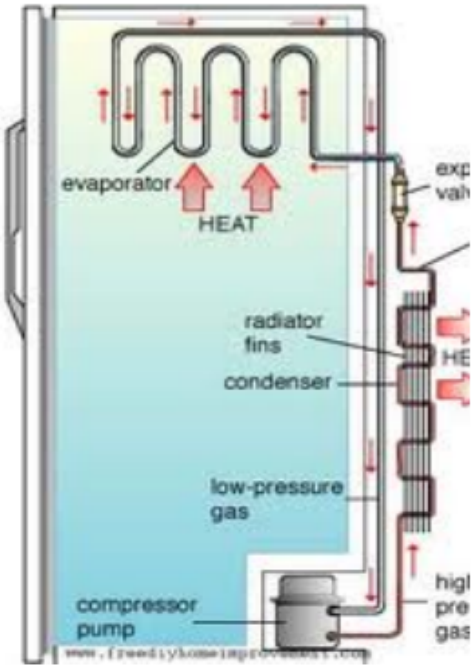
Air standard efficiency of the Otto cycle is given by ,

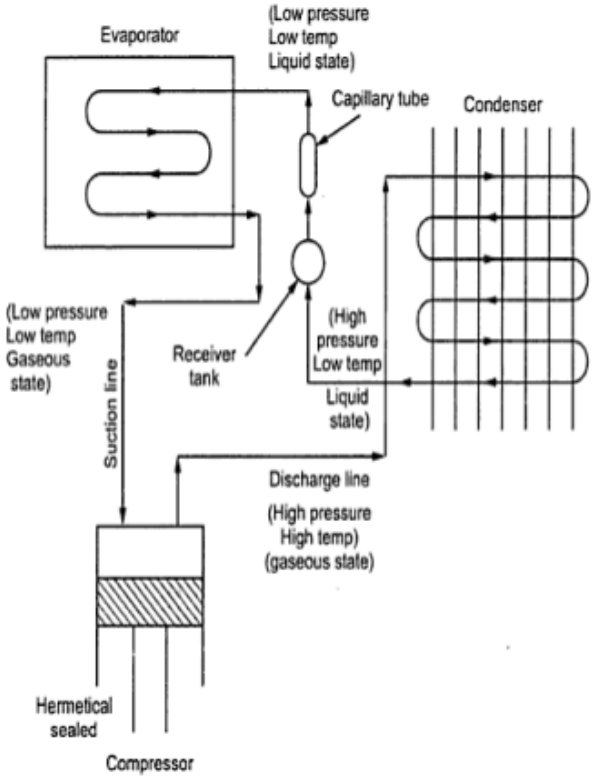
$$\eta = 1 - \frac{1}{r^{\gamma - 1}}$$

where r is the compression ratio and gamma is the index of adiabatic compression for air.

Q.15. Explain with sketch domestic refrigerator

ANS:





Schematic diagram of Domestic refrigerator

A refrigerator work on vapour compression cycle. It uses R-12 [Freon-12] as refrigerant. It has following important parts:-

1. Hermetically sealed compressor:- It is mounted on bottom-most part behind compartment. The compressor is vacuum sealed to reduce noise and vibrations.

2. Evaporator:- It has box type construction. The refrigerant tubes are wrapped or brazed around ice box. It is located on the top side of the refrigerator to make natural circulation of air from top to bottom.

Formulas are grouped and explained with each term to facilitiate the remembering.

a) Problems On single stage compressor

Formulas:-

Work done Isothermal :- $w = P_1 V_1 In\,(\frac{P_2}{P_1})$

$$w = mRT_1 In\,(\frac{P_2}{P_1})$$

Polytropic :- $W = \frac{n}{n-1} \times P_1 V_1 [(\frac{P_2}{P_1})^{\frac{n-1}{n}} - 1]$

$$W = \frac{n}{n-1} \times mRT_1 [(\frac{P_2}{P_1})^{\frac{n-1}{n}} - 1]$$

Adiabatic :- $W = \frac{\gamma}{\gamma-1} \times P_1 V_1 [(\frac{P_2}{P_1})^{\frac{\gamma-1}{\gamma}} - 1]$

$$W = \frac{\gamma}{\gamma-1} \times mRT_1 [(\frac{P_2}{P_1})^{\frac{\gamma-1}{\gamma}} - 1]$$

Power:-

Power = work done $\times \frac{N}{60}$... watts

When Volume is given in,

- $m^3 \rightarrow work\ is\ obtained\ in\ N-m\ /\ cycle.\ \{J\ /\ cycle\}$
- $\frac{m^3}{sec} \rightarrow work\ is\ obtained\ in\ watts$

Isothermal Efficiency :- $\eta_{ith} = \frac{isothermal\ work}{indicated\ work\ (power)} \times 100$

Numerical problems in exercise have been provided with answers for verification .

Numerical Problems

1) A single stage single acting reciprocating air compressor has bore 800mm and stroke 400mm It is required to compress air to drive the compressor if it is running at 200 rpm considering.

2) A single stage single acting reciprocating compressor sucks the air of 0.0143 m3 at 1 bar and delivers it at 12 bar following PV1.3 = C. Find power it running at 400 rpm also find isothermal efficiency.

3) A single stage single acting air compressor delivers at 5 bar. A suction temperature is 200C and suction pressure is 1 bar. The volume of air entering the compressor is 3m3/min. Take index of compression 1.2 calculate isothermal efficiency of compressor.

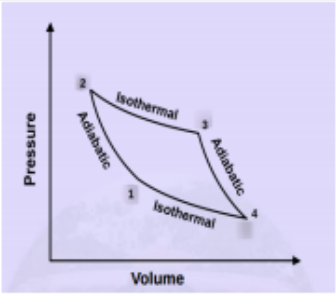
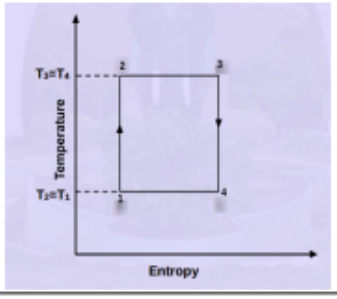
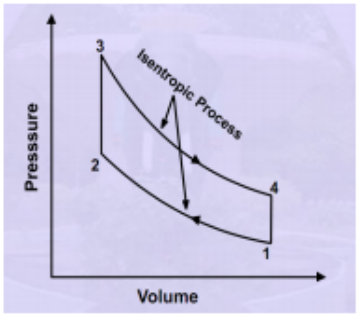
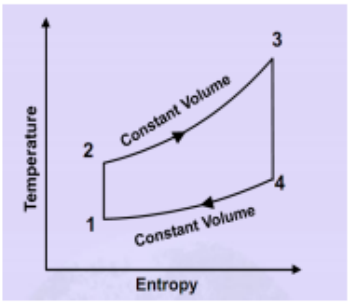
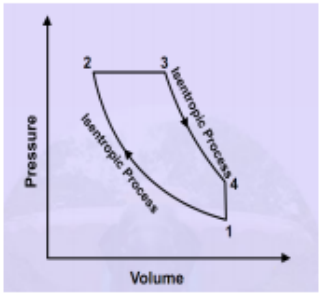
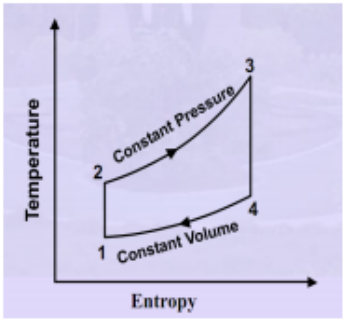
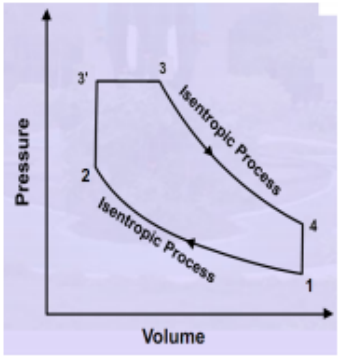
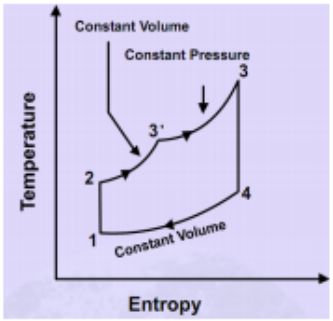
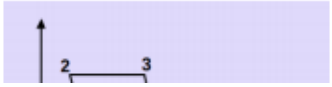
4) A single stage single acting air compressor has piston displacement 0.05m3 air is sucked at 1bar and 170c compressed to 6 bar. Find workdone and temp at end of compression in following two eases.
1. Polytropic process (n = 1.3)
2. Isothermal process

5) A single stage acting air compressor has bore diameter 250mm and stroke 370mm. It compress air from 1bar to 7.5 bar following the law PY1.25 = C. Find
1. Power required
2. Isothermal efficiency, If it is running at 230 rpm.

6) A rock drill required 10 kg/min of air at 6bar. Find power required to drive single acting compressor receiving air at 1bar and 27^0c. Also find isothermal efficiency.

Snapshot for easy remembering the complex topics...

Snapshot of all 5 cycles in one table

Cycle	P-v Diagram	T-S Diagram
Carnot Cycle		
Otto Cycle		
Diesel cycle		
Dual Cycle		
Brayton cycle		

Each chapter is provided with the analysis of the each years

question asked. This is important because it gives idea about the weightage and the location of the question asked.

Also it provides the location where the questions from a particular chapter are asked.

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