

ASSIGNMENT - 6

REFRIGERATION & AIR CONDITIONING

Q-1

(a) A single stage reciprocating compressor takes 1 m^3 of air per minute at 1.013 bar and 288 K and delivers it at 7 bar. Assuming that the law of compression is $PV^{1.35} = C$ and the clearance is negligible, calculate (i) the mass delivered/min, (ii) delivery temperature, (iii) indicated power and (iv) isothermal efficiency. (GTU Dec.2008)

(b) Same problem but calculate only (iii) (GTU March 2009)

Q-2

A single cylinder, single acting air compressor has a cylinder diameter 150 mm and stroke length 300 mm. It draws air into its cylinder at a pressure of 1 bar and temperature 27°C . This air is then compressed to a pressure of 6.5 bar. If the compressor runs at a speed of 120 RPM determine (i) mass of air compressed / cycle (2) work required cycle (3) Power required to drive the compressor if the compressor is adiabatic.

Q-3

Air is to be compressed in a single stage reciprocating compressor from 1.013 bar and 15°C to 7 bar. Calculate the indicated power required for a free air delivery of $0.3 \text{ m}^3/\text{min}$ when the compression process is . Air is to be compressed in a single stage reciprocating compressor from 1.013 bar and 15°C to 7 bar. Calculate the indicated power required for a free air delivery of $0.3 \text{ m}^3/\text{min}$ when the compression process is (i)isentropic (ii) reversible isothermal (iii) polytropic with $n = 1.25$. What will be the delivery temperature in each case? Neglect clearance

Q-4

The following data are available for a single stage single acting reciprocating compressor without clearance.

Atmospheric air ... 1 bar, 27°C

Discharge Pressure ... 7 bar

Law of compression and expansion = $PV^{1.3} = C$

Compressor takes 1 m^3 of air/min.

Speed of the compressor = 300 RPM $L/D = 1.5$ Mechanical efficiency = 85%

Moter transmission efficiency = 90%

Calculate (1) Indicated power (2) Isothermal efficiency (3) Cylinder dimensions

(4)Moter power