4TH SEM./MECH/MECH(IND INTG)/ MECH(MAINT)/
MECH(PROD)/ DME/MECH(SWICH)/ 2022(S)
Th4 Thermal Engineering-II

Full Marks: 80   Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks
(Use of steam table and mollier chart are allowed)

1.   Answer **All** questions   2 x 10

   a.   What do you mean by calorific value of fuel?

   b.   Write four industrial uses of compressed air.

   c.   Define pressure ratio of air compressor.

   d.   Define Dryness fraction of steam.

   e.   State kirchoff's law.

   f.   Define Grate for boiler.

   g.   What are the function of boiler mountings with example?

   h.   Define steam and its uses.

   i.   Carnot cycle is not used as a standard reference cycle in any steam power plant, why?

   j.   Define air-fuel ratio.

2.   Answer **Any Six** Questions   6 x 5

   a.   The cylinder dimensions of a single stage single acting reciprocating compressor are 300mmx200mm. The compressor runs at 150r.p.m. The intake pressure and temperature of air are respectively 1 bar and 25^{0}c and the discharge pressure is 10bar. Determine the work done per cycle when compression follows the law

      (i) $PV^{1.25}$=c
      (ii)   PV=c

   b.   What are classification of air compressors?

   c.   State the modes of heat transfer and explain it.

   d.   Give a comparison between forced draught and induced draught.

e. What is the difference between Reheat cycle and Regenerative cycle?

f. The thermal efficiency of a carnot heat engine is 60.5%. The minimum temperature of the cycle is 25^0c. Find the maximum temperature of the cycle.

g Deduce a formula for work done by a single stage single acting reciprocating air compressor when the law of expansion is PV^n=constant neglecting clearance.

3   Steam is being generated in a boiler under a pressure of 12bar. Find   10
the enthalpy of 5kg of steam, when
    (i)   Steam is wet having dryness fraction of 0.75
    (ii)   Temperature of steam is 300^{0c}. Take C_p= 2.1kJ/kg.

4   Describe carnot cycle with vapour with the help of P-V, T-S and H-S   10
diagrams and deduce a formula for itS thermal efficiency.

5   Describe the construction and working of Cochran boiler.   10

6   An engine uses 6.5kg of oil per hour of calorific value of 30,000kJ/kg.   10
if the B.P of the engine is 22kw and mechanical efficiency 85%.
Calculate
    (i)   Indicated thermal efficiency.
    (ii)   Brake thermal efficiency
    (iii)   Specific fuel consumption in kg/B.P/h.

7   Describe Rankine cycle with the help of P-V. T-S and H-S diagram and   10
deduce a formula for its thermal efficiency considering feed pump
work.