Roll No .....

ME - 404

B.E. IV Semester Examination, December 2014

Thermal Engineering And Gas Dynamics

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
ii) All parts of each questions are to be attempted at one place.
iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.
iv) Except numericals, Derivation, Design and Drawing etc.
v) Use of steam table is permited.

Unit - I

1. a) Write some Guide lines for the choice of a new boiler?

   b) What is Fluidized Bed Boilers (FBB)?

   c) What are characteristics of high pressure Boilers?

   d) Write limitations of Lamont and Benson Boilers.

OR

The following observations were made in a boiler trail. coal used 250kg of calorific value 29,800 kJ/kg, water evaporated 2000kg, steam pressure 11.5 bar, dryness fraction of steam 0.95 and feed water temperature 34°C. Calculate equivalent evaporation per kg of coal and efficiency of the boiler.

Unit - II

2. a) Write four properties of working fluid used in binary vapor cycle.

   b) Write effect of boiler pressure, and superheat temperature on Rankine efficiency.

   c) What are difficulties to use carnot cycle in practice?

   d) Derive an expression for efficiency of modified Rankine cycle (Steam Engine Cycle).

OR

A steam power plant works between 40 bar and 0.04 bar. If the steam supplied is dry saturated and the cycle is Rankine cycle. Calculate Rankine cycle efficiency.

Unit - III

3. a) Define mach number.

   b) Write effects (Four) of super-saturated flow in the nozzle.

c) Derive relation between stagnation temperature and static temperature.

d) Air at a temperature 27°C is flowing at M = 2.8. Calculate the velocity of flow in m/sec and mach angle.

OR

Determine the steam velocity of the nozzle, if dry saturated steam at 6 bar with negligible velocity expands isentropically in a convergent nozzle to 1 bar. The dryness fraction of steam is 0.95.

Unit - IV

4. a) Define Isothermal efficiency of Reciprocating Air compressor.

b) Write four advantages of multistage compressor.

c) Classify Air compressor.

d) Compare seven salient features of Reciprocating and Rotary compressor.

OR

Find the minimum work and power required to drive the compressor for a two stage air compressor which takes $3m^3$ of air per minute at a pressure of 1 bar and temperature of 27°C. The air is delivered at a pressure of 9 bar. The cooling is perfect and compression process follows the law $p.v.^{1.25} = C$.

Unit - V

5. a) Define vacuum efficiency of condenser.

b) Write the source of air leakage in condenser.

c) Classify cooling towers. What factors affecting the rate of Evaporation?

d) Define Fouling Factor? Explain LMTD method of heat exchanger?

OR

In a double pipe counter flow heat exchanger, 10,000 kg/h of an oil having a specific heat of 2095 J/kg.k is cooled from 80°C to 50ºC by 8000 kg/h of water entering at 25°C. Determine heat exchanger area for an overall heat transfer coefficient of 300 w/m^2k. Take Cp for water as 4180 J/kg.K.

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