Total No. of Questions :5] *[Total No. of Printed Pages :4*

Roll No .....

ME - 404

B.E. IV Semester

Examination, June 2015

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.

Unit - I

1. a) What is super critical boilers? Give their advantages.

   b) Write down the difference between conventional boiler and high pressure boiler.

   c) Write short note on boiler draught.

   d) Describe the construction and working of La-mont boiler with the help of neat sketches.

   OR

   In a boiler test 1250 kg of coal are consumed in 24 hours. The mass of water evaporated is 13000 kg and the mean effective is 7 bar. The feed water temperature was 40°C,

Unit - V

5. a) Write down the classification of condensers.

   b) What is meant by fouling factor.

   c) Explain the effect of air leakage in a condenser.

   d) Derive an expression for log mean temperature difference for "parallel flow".

   OR

   The following observations were taken during a test on a surface condenser.

   Vacuum in the condenser = 715 mm of Hg

   The Barometric reading = 755 mm of Hg

   Temperature in condensate = 28°C

   Determine:

   i) Partial pressure of air leakage

   ii) Mass of air per kg of steam

   iii) Vacuum efficiency

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heating value of coal is 30000 kJ/kg. The enthalpy of 1 kg of steam at 7 bar is 2570.7 kJ. Determine:

i) Equivalent evaporation per kg of coal
ii) Efficiency of the boiler.

Unit - II

2. a) Write briefly reheat factor.
   b) Write down advantages of reheating.
   c) What are the various losses in a steam power plant.
   d) Explain 'regenerative cycle' with the help of neat diagram and also derive an expression for its thermal efficiency.

OR

In a Rankine cycle, the steam at inlet to turbine is saturated at a pressure of 35 bar and the exhaust pressure is 0.2 bar. Determine.

i) The pump work
ii) The turbine work
iii) The Rankine efficiency
iv) The condenser heat flow
v) The dryness at the end of expansion

Assume flow rate of 9.5 kg/s.

Unit - III

3. a) Define Mach number. Write down the significance of mach number.
   b) What is the effect of friction on the flow through a steam nozzle.
   c) Define the following:

i) Mach Cone
ii) Zone of Silence
iii) Zone of Action

d) Derive an expression for maximum discharge of steam through a steam nozzle.

OR

Find the mach number when an aeroplane is flying at 1100 km/hour through still air having a pressure of 7 N/cm^2 and temperature –5°C. Wind velocity may be taken as 2000. Take R = 287.14 J/kg k. Calculate the pressure, temperature and density of air at stagnation point on the nose of plane. Take Y = 1.4.

Unit - IV

4. a) What is multistage compression. Write down its advantages.
   b) Define the volumetric efficiency of Reciprocating compressor.
   c) Compare between reciprocating and rotary compressors.
   d) Determine the number of stages required for a multistage air compressor which is designed to elevate the pressure from 1 bar to 90 bar. The pressure ratio will not exceed 4. Also determine, exact stage pressure ratio and intermediate pressures.

OR

A single acting reciprocating air compressor has a cylinder diameter and stroke of 200 mm and 300 mm respectively. The compressor sucks air at 1 bar and 27°C and delivers at 8 bar, while running at 100 rpm. Find

i) Indicated power of the compressor
ii) Mass of air delivered by the compressor per minute.
iii) Temperature of air delivered by the compressor.

The compression follows the law $pv^{1.25} = C$, Take R as 287 J/kg k.