

- d) An air compressor takes in air at 1 bar and 27°C and delivers it after compression at 5 bar. Find the :
- Work done rgpvonline.com
 - Heat transfer
 - Change in internal energy when compression process are
 - Isothermal
 - Reversible adiabatic

OR

Derive the equation for minimum work done in terms of intermediate pressure of multistage compressor.

5. a) Explain the term vacuum and how it is measured?
 b) How air leakage affects the performance of condenser?
 c) What is fouling factor? What is difference between counter flow and parallel flow condenser.
 d) A steam condenser is equipped in a steam power plant which handles 15000 kg/hr of steam and develops 2.5MW power. The initial condition of steam 27 bar, 300°C, the exhaust after condenser maintained at 72 cm of Hg. While barometer reading 76 mm of Hg. Temperature at circulating water increases from 20°C to 28°C. While condensate removed at a temperature of 27°C, workout followings:
- 7.5 diagram
 - Dryness fraction of steam entering the condenser
 - Mass rate of circulating water and cooling ratio
 - Degree of under cooling

OR

Explain various types of cooling tower and its design construction.

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Roll No

ME - 404 rgpvonline.com**B.E. IV Semester**

Examination, December 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 question 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.

1. a) Define super critical boiler.
 b) What are difference between forced circulation and natural circulation?
 c) What are the advantages of High pressure Boiler?
 d) The following reading were obtained during a boiler trial of 5 hours duration.
 Mean steam pressure = 15 bar
 Mean of steam generated = 50,000 kg
 Mean dryness traction = 0.85
 Mean water temperature = 30°C
 Coal used = 4000kg,
 Calorific value of coal = 33400 kJ/kg

Calculate: rgpvonline.com

- i) Factor of equivalent evaporation
- ii) Equivalent evaporation from and at 100°C
- iii) Efficiency of boiler

OR

- i) How much air used 1 kg of coal burnt in a boiler having Chimney height 50m to create a draught of 30.2 mm of water column when the temperature of the gases in the Chimney is 370°C and the temperature of boiler house is 25°C.
- ii) What are advantages of artificial draught over natural draught.

2. a) What are limitations of Carnot cycle?
- b) How can we increase the efficiency of Rankine cycle?
- c) Derive an expression of thermal efficiency for regenerative cycle.
- d) In a Rankine cycle, the steam at inlet to turbine is saturated at pressure of 30 bar and the exhaust pressure is 0.25 bar. Determine:

- i) Pump work
- ii) Turbine work
- iii) Rankine efficiency
- iv) Condenser heat flow
- v) Dryness at the end of expansion
- vi) Work ratio

Assume mass flow rate = 10 kg/sec

OR

- i) Explain the binary vapour cycle with neat line diagram.
- ii) Explain the modified Rankine cycle and show the modification by P-V and T-S curve.

3. a) How can we find the stagnation state? Write the equation for stagnation properly in isentropic flow.
- b) What is Mach number? How is it useful for calculation of gas-flow?
- c) Derive the equation

$$\frac{dA}{A} = \frac{dV}{V} (m^2 - 1)$$

Where A = area of cross section of duct

V = velocity of gas through duct

- d) Define the critical pressure ratio, for the nozzle of steam turbine and derive the equation for maximum flow rate at throat in terms of critical pressure ratio.

OR

- i) Explain metastable flow of steam in nozzle.
- ii) Derive the expression for nozzle efficiency.

4. a) What are effect of clearance on the performance of reciprocating compressor.
- b) Why is multistage essential for high compression ratio?
- c) Classify the rotary compressor and write comparison of rotary and reciprocating compressor.