Roll No .....

MMTP - 201

M.E./M.Tech., II Semester

Examination, December 2015

Thermal Power Plant Engineering

Time : Three Hours

Maximum Marks : 70

Note : i) Attempt any five questions.

ii) All questions carry equal marks.

iii) Use of steam tables and Molier Diagram is permitted.

iv) Assume suitable data wherever necessary.

v) Make suitable and neat diagrams if required.

1. a) Discuss the various components of steam thermal power station. Discuss the flow diagram and temperature entropy of the basic cycle adopted in thermal power stations for different steam conditions available at the entrance to the turbine.

   b) The boiler produces dry and saturated steam at 30 bar. The steam expands in the turbine to a condenser pressure of 20,000 N/m^2. Draw the Rankine vapour power cycle on temperature-entropy and enthalpy-entropy diagram and calculate :

      i) Net work done and

      ii) Thermal efficiency of the cycle

2. a) Explain with neat diagram, the working of economizer and Logarithmic Mean Temperature difference approach in its design.

b) The equivalent evaporation of a boiler from and at 100°C is 10.4 kg/kg of fuel. The calorific value of fuel is 29,800 kJ/kg. Determine boiler efficiency if the boiler produces 15,000kg of steam per hour from feed water at 40°C and the fuel used is 1650 kg/hr. Also find out the condition of steam produced.

3. a) How specifications and contract documents are prepared and what sort of guarantee is assured?

   b) Why training is essential for power plant personnel? What sort of safety is essential in thermal power plants and how is it maintained?

4. a) How site is selected for installation of coal based thermal power plant? Give the steps of commissioning and various operational checks of thermal plant.

   b) Prepare a heat balance sheet of different items and for entire thermal power plant and assume suitable data for illustration if necessary.

5. a) Discuss the different types of instruments used for pressure, flow and temperature measurement in coal-based thermal power plant with neat sketches.

   b) Discuss various types of control valves and actuators. Illustrate pipe flexibility analysis.

6. a) Explain the principle and working of shell-and-tube type surface condenser with the help of neat diagram.

b) A closed vessel of 0.71 m^3 capacity contains saturated water vapour and air at a temperature of 43°C and a pressure of 0.14 bar absolute. Due to further air leakage into the vessel, the pressure rises to 0.28 bar absolute and temperature falls to 38°C. Calculate the mass of air which has leaked in. Take R = 0.287 KJ/kg-k for air.

7. a) Discuss the coal handling systems with neat sketches. What is pulverized coal and how does it affect in the plant performance?

   b) What are the different methods of reheating the steam? Explain with the help of neat diagrams.

8. Write any Four short notes from the following :

   a) Super-critical power plants

   b) Cooling towers

   c) Piping and Insulation

   d) Pollution control in a thermal power plant

   e) Training of power plant personnel

   f) Fluidized bed combustion

   g) Pneumatic and Electro-Mechanical transducers and controllers.

******