This question paper contains 3 printed pages.

3292 *Your Roll No.* .....

B. Tech. (E) / II **J**

Paper VI— POWER PLANT ENGINEERING
(EEE-206)

Time : 3 hours *Maximum Marks* : 70

(Write your Roll No. on the top immediately on receipt of this question paper.)

Answer any five questions. Use of steam tables and Mollier diagram is permitted.

Assume suitable missing data, if any.

1. (*a*) Explain the modifications in the Rankine cycle to improve its efficiency. Draw T–S and schematic diagram for each case. 7

(*b*) In a power plant steam enters into steam turbine at 150 bar and 450°C and comes out at 0·1 bar. Reheating of steam has been done optimally (P_{RH} / P_{in}=0·3). One closed feed heater is also placed optimally with drip to condenser. Draw T–S and schematic diagram and calculate efficiency. 7

2. (*a*) Derive a relation between change in area and change in velocity in a flow through nozzle and show that in supersonic nozzle velocity increases

P. T. O.

with increase in area. Briefly explain super-saturated flow in nozzle. 7

(*b*) The nozzle of an impulse stage of a turbine recieves steam at 15 bar and 300°C and discharges it at 10 bar. The nozzle efficiency is 90% and the nozzle angle is 20°. The blade speed is that required for maximum work, and entry of steam is without shock. The blade exit angle is 5° less than the inlet blade angle. Blade friction factor is 0·9. Calculate power and efficiency. 7

3. (*a*) Write the sources of non condensible gases in the condenser and effect of these gases on condenser vacuum. Show the arrangement to remove these gases and also derive expression for vacuum efficiency. 7

(*b*) What is meant by internal and external water treatment system in the power plant? Explain external water treatment system in detail. 7

4. (*a*) Explain the working of coal handling system used in power plant. 7

(*b*) Explain process of bottom ash collection, and briefly explain utilisation of ash. 7

5. (*a*) Explain open and closed cooling water system used for condensation of steam in the condenser. Discuss variation of TTD with age of condenser. 7

(*b*) Justify the need of compounding of steam turbine

and discuss velocity compounding with pressure distribution. 7

6. (*a*) Explain the methods used to control the super-heated steam temperature. 7

(*b*) Discuss measurement of flow and pressure in the plant at any one point. 7

7. (*a*) Explain working of combined cycle gas turbine and derive expression for overall efficiency of plant. 7

(*b*) Explain working of hydroelectric power plant and show that the maximum efficiency of Pelton turbine is $(1+\cos\beta)/2$ where β is bucket angle at outlet. 7

8. Write short notes on any *three* of the following:

(*a*) Load curves

(*b*) Nuclear power plant

(*c*) Surge tank in Hydroelectric plant

(*d*) Economiser (+) superheaters

(*e*) Chocked nozzle. 14