15346

B. Tech 8th Semester Examination

Power Plant Engineering (OS)

ME-8002

Time : 3 Hours   **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, selecting one question from each section A, B, C and D. Section E is compulsory. Assume any suitable missing data if any. Use of non-programmable calculator is allowed.

SECTION - A

1. How does a modified Rankine Cycle differ from a Rankine cycle? Deduce the expression of modified Rankine efficiency.
(20)

2. Define run-off. How it is measured? Explain any two methods for the measurement of run-off. What are the factors affecting the run-off?   (20)

SECTION - B

3. Draw an explanatory line diagram of an ash handling system employed in steam power plants and also explain the difficulties encountered in the handling of ash in a thermal power station.
(20)

4. Explain the regenerative cycle with the help of neat diagram and derive the expression for its thermal efficiency.   (20)

[P.T.O.]

SECTION - C

5. A simple constant pressure open cycle gas turbine plant draws air at 100 kPa (1 bar) and 17°C and compresses it through a pressure ratio of 4. The air then passes to the combustion chamber and after combustion of fuel; the gases enter the turbine at a temperature of 650°C and expand to 100 kPa. Assuming the isentropic efficiency of both the compressor and the turbine as 85 per cent, calculate: (a) the power required to drive the compressor if it has to handle 2 kg of air per second, (b) the power developed by the turbine, (c) the net plant work output per kg of air, (d) the thermal efficiency of the plant, and (e) the work ratio of the plant. Assume c_p = 1.026 kJ/kg K and γ = 1.4 for both air and gases. Neglect the mass of fuel burnt and the loss of pressure in the combustion chamber.   (20)

6. What is chain reaction? How it is maintained? What is the difference between controlled and uncontrolled chain reaction? Explain with neat sketches and with examples.   (20)

SECTION - D

7. Find the cost of generation per kWh from the following data.

Capacity of the plant - 120mW

Capital cost - Rs. 1,200 per kW installed

Interest and depreciation - 10% on capital

Fuel consumption - 1.2 kg/ kWh

Fuel cost - Rs. 40 tons

Salaries, wages, repairs and maintenance - Rs. 6, 00,000 / year

The maximum demand is 80 mW and load factor is 40%.
(20)

8. (a) Enumerate the different types of concentrating type collectors.   (15)

    (b) Why orientation is needed in concentrating type collectors?   (5)

SECTION - E

9. Attempt the following:

    (i)   What is the significance of incremental rate of a power plant?

    (ii)   What are the various operating cost of coal fired steam power plant?

    (iii) Define "Diversity factor"

    (iv)   What is fixed cost and operating cost?

    (v)   Why is the maximum cycle temperature of gas turbine plant much lower than that of diesel power plant?

    (vi)   What is the basic principle of a magneto hydro dynamic (MHD) generator?

    (vii) What is principle of OTEC?

    (viii) What are the components of tidal power plant?

    (ix)   What is "half life" of nuclear fuels?

    (x)   List down the nuclear waste disposal method.
                                                                  (10×2=20)