

- N.B.:** (1) Question No. 1 is compulsory.
 (2) Attempt any 3 questions out of 5 questions.
 (3) Figures to the right indicate full marks.
 (4) Illustrate your answers with sketches wherever necessary.

Q.1 Solve any four from remaining in six questions

- a) What are the points taken in to account while selection of power plants. 05
- b) How rainfall and run-off measurements are carried out? 05
- c) Explain the working of electrostatic precipitator with neat sketch. 05
- d) Why combined power plants are advantageous in terms of performance? 05
- e) Write a short note on nuclear waste disposal. 05
- f) Explain the importance of load curve in designing the power plant. 05

Q.2

- a) The data for a weekly flow at a particular site is given below for 12 weeks: 12

Week	Weekly flow m ³ /sec
1	3000
2	2000
3	2700
4	1000
5	750
6	500
7	600
8	2250
9	4000
10	200
11	1500
12	1000

- (i) Draw hydrograph and Mass curve.
- (ii) With help of mass curve, find the size of the reservoir and the possible rate of available flow after the reservoir has been built.

- b) Explain various parameters affecting the thermodynamic efficiency of combined cycles. 08

Q.3

- a) The two power stations X and Y supply to a system whose maximum load is 120 MW and minimum load is 12 MW during the year. The estimated costs of these stations are as follows: 12

$$C_x = \text{Rs.}(120 \times \text{kW} + 0.028 \times \text{kWh})$$

$$C_y = \text{Rs.}(115 \times \text{kW} + 0.032 \times \text{kWh})$$

If the load varies as a straight line, find for minimum cost of generation:

- (i) Installed capacity of each station.
- (ii) The annual load factor, capacity factor and use factor of each machine.
- (iii) The average cost of production per kWh for the entire system.

Assume reserve capacity of Y as 22%.

- b) Explain BWR with neat sketch. 08

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Q.4

- a) The steam station has two 110 MW units. Following costs data is given below.

12

Particulars	Units A	Units B
Capital cost (Rs)	2400	3000
Fixed charge rate (%)	10	10
Capital factor	0.55	0.60
Fuel consumption (kg/kWh)	1	0.9
Fuel cost (Rs per 1000 kg)	96	96
Annual cost of operation, labor, maintenance and supplies (% of annual fuel cost)	20	15
Utilization factor	1	1

Calculate following

- (i) Annual plant cost and generation cost of unit A.
(ii) Annual plant cost and generation cost of unit B.
(iii) Overall generation cost of the station.
- b) Explain different tariff methods of electrical energy.

08

Q.5

- a) Explain flow sheet and working of modern thermal power plant. 10
b) The incremental fuel cost for two generating units 1 and 2 of a power plant are given as follows 10

$$\frac{dF_1}{dP_1} = 0.07 P_1 + 24$$

$$\frac{dF_2}{dP_2} = 0.075 P_2 + 22$$

Where F is fuel cost in Rs/hour and P is power output in MW. Determine:

- (i) The economic loading of the two units when the total load is supplied by the power plant is 180 MW.
(ii) The loss in fuel cost per hour if the load is equally shared by both the units.

Q.6 Solve any four from remaining in six questions

- a) Write short note on economic load sharing in power plants. 05
b) Explain advantages and limitations of nuclear power station. 05
c) Explain PFBC systems. 05
d) Write short note on coal handling systems. 05
e) Explain Rankine cycle with P-V and T-S diagram. 05
f) Compare hydro-electric power plant with gas turbine power plant. 05
