

Time : 3 Hours

Max. Marks : 60

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 : (i) Attempt five questions in all selecting one question each from section A, B, C and D. Section E is compulsory.

- (ii) All parts of a question should be answered at one place.
(iii) Answer should be brief and to-the-point and be supplemented with neat sketches.

SECTION - A

1. Draw the schematic layout of a modern thermal power plant. Explain the function of each major component and discuss the factors affecting its efficiency. (12)
2. (a) Classify hydroelectric power plants. What are the advantages and limitations of a hydroelectric power plant compared to thermal power plants? (6)
(b) Discuss the environmental concerns and safety measures associated with nuclear plants. (6)

SECTION - B

3. (a) Define the terms diversity factor, maximum demand, and utilization factor. (6)
(b) A central power station has a Load factor of 60%, a capacity factor of 40%, and a utilization factor of 45%. The power station has a maximum demand of 15000 kW.

Determine the annual energy production and reserve capacity of the plant, which is the maximum energy that can be produced daily if the plant's operating schedule is fully loaded during operation. (6)

4. A power station has a maximum demand of 100 MW and the daily load curve is defined as follows:

Time (hours)	0-6	6-8	8-12	12-14	14-18	18-20	20-24
Load(kW)	4500	3500	7500	2000	8000	2500	5000

Plot the load curve and load duration curve, also determine the load factor and plant capacity factor if the capacity of the plant is 12 MW. (12)

SECTION - A

5. (a) Describe the various constraints related to the Unit Commitment Problem. (6)
(b) Explain the problem of short-term Hydro-thermal scheduling and discuss various constraints under which this problem is defined. (6)
6. The fuel inputs per hour of plants 1 and 2 are given as

$$F_1 = F_1(PG_1) = 120 + 40PG_1 + 0.2PG_1^2 \text{ Rs./h}$$

$$F_2 = F_2(PG_2) = 150 + 30PG_2 + 0.15PG_2^2 \text{ Rs./h}$$

Calculate the economic operating schedule and the corresponding cost of generation. The maximum and the minimum loading on each unit are 100MW and 25MW. Assume the transmission losses are ignored and the total demand is 180MW. Also, determine the savings obtained if both units equally share the load. (12)

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SECTION - D

- 7. Define the term tariff. What are the objectives of a tariff? Describe block rate and maximum demand tariff with their advantages and disadvantages. (12)
- 8. Explain the principle of operation of a solar photovoltaic system with PV and IV characteristics. How does solar radiation affect performance? (12)

SECTION - E (Compulsory)

- 9. (a) What are the functions of a moderator and control rods in a nuclear reactor?
- (b) Define peak load and base load.
- (c) Define the economic dispatch problem.
- (d) Define incremental cost?
- (e) What is the need for hydrothermal scheduling?
- (f) Write two advantages of hybrid renewable systems. (6×2=12)