

Q₁: A:

A system consists of two units to meet the daily load cycle as shown in Fig. 1.

The cost curves of the two units are:

$$C_1 = 0.15 P_{G1}^2 + 60 P_{G1} + 135 \text{ Rs./hr}$$

$$C_2 = 0.25 P_{G2}^2 + 40 P_{G2} + 110 \text{ Rs./hr}$$

The maximum and minimum loads on a unit are to be 220 and 30 MW, respectively.

Find out:

- i. The economical distribution of a load during the light-load period of 7 hr and during the heavy-load periods of 17 hr. In addition, find the operation cost for this 24-hr period operation of two units.
- ii. The operation cost when removing one of the units from service during 7 hours of light-load period. Assume that a cost of Rs. 525 is incurred in taking a unit off the line and returning it to service after 7 hr.
- iii. Comment on the results.

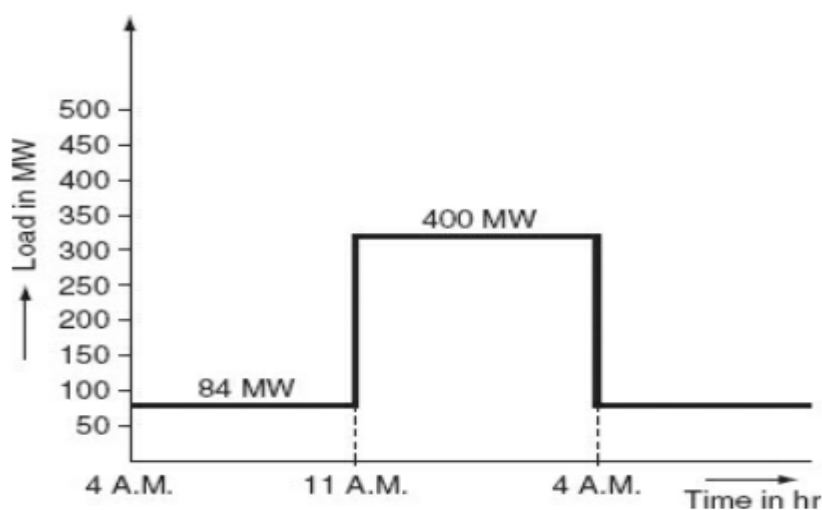


FIG. 2.11 Daily load cycle

Q₁: B: Choose the correct answer:

$\frac{\partial C_i}{\partial P_{G_i}} + \lambda \frac{\partial P_L}{\partial P_{G_i}} = \lambda$ is called the co-ordination equation because:

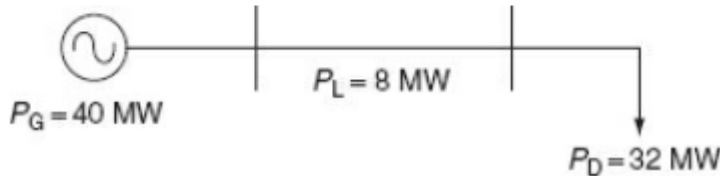
- a. It co-ordinates ITL with IC.
- b. It co-ordinates ITL with penalty factor.
- c. It co-ordinates real-power generation with reactive-power generation.
- d. It co-ordinates bus voltage magnitude with IC.

In solving optimization problem with transmission loss consideration, the condition for optimality is obtained as:

- The IC of all the plants must be the same.
- The IC of each plant multiplied with its penalty factor must be the same for all the plants.
- The IC of each plant divided by its penalty factor must be the same for all the plants.
- The IC of each plant subtracted from its penalty factor must be the same for all the plants.

The penalty factor of the plant shown in Fig. 3.14 is:

- 5.
- 5.25.
- 1.25
- 12.5



The transmission loss is expressed as:

- $P_L = \sum_{p=1}^n \sum_{q=1}^n P_{G_p}^2 B_{pq} P_{G_q}^2$.
- $P_L = \sum_{p=1}^n \sum_{q=1}^n P_{G_p} B_{pq}^2 P_{G_q}$.
- $P_L = \sum_{p=1}^n \sum_{q=1}^n (P_{G_p} B_{pq} P_{G_q})^2$.
- $P_L = \sum_{p=1}^n \sum_{q=1}^n P_{G_p} B_{pq} P_{G_q}$.

Q₂: A:

Ex 3.17 Two thermal plant supply power to a load as shown in Fig. 3.11

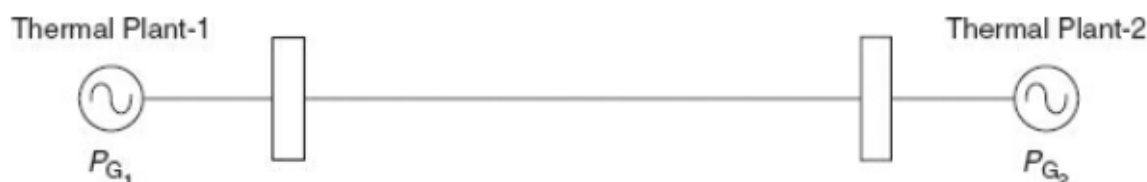
$$\frac{dC_1}{dP_{G1}} = 20 + 10P_{G1} \text{ Rs./MWh}$$

$$\frac{dC_2}{dP_{G2}} = 15 + 10P_{G2} \text{ Rs./MWh}$$

where p_{G1} and p_{G2} are expressed in p.u. in 100-MVA base. The transmission loss is given by

$$P_L = 0.1P_{G1}^2 + 0.2P_{G2}^2 + 0.1P_{G1}P_{G2} \text{ p.u.}$$

If the incremental cost of received power is 50 Rs./MWh, find the optimal generation.



Q₂:B:

A power system operates an economic load dispatch with a system λ of 60 Rs./MWh. If raising the output of Plant-2 by 100 kW (while the other output is kept constant) results in increased power losses of 12 kW for the system, what is the approximate additional cost per hour if the output of this plant is increased by 1 MW?

Q₃: A:

A power system is supplied by only two plants, both of which operate on economical dispatch. At the bus of Plant-1, the incremental cost is 55 Rs./MWh and at Plant-2 is 50 Rs./MWh. Which plant has the higher penalty factor? What is the penalty factor of Plant-1 if the cost per hour of increasing the load on system by 1 MW is 75 Rs./hr?

Q₃: B:

Define (1- Daily Load Curve 2- Load–Duration Curve 3- Connected load 4- Firm power 5- Base load)

Q₃: C:

Choose the correct answer:

1. In order to have a low cost of electrical generation,
 - a. The load factor and diversity factor are high.
 - b. The load factor should be low but the diversity factor should be high.
 - c. The load factor should be high but the diversity factor should be low.
 - d. The load factor and the diversity factor should be low.
2. The choice of number and size of units in a station are governed by best compromise between:
 - a. A plant load factor and capacity factor.
 - b. Plant capacity factor and plant-use factor.
 - c. Plant load factor and use factor.
 - d. None of these.

Sohag Univ. Faculty of Engineering

Power System Control Exam Model, 4th Power and Machines Section, July 2020

Dr. Farrag Time: Three Hours Total Marks: 150 The model is 4 Pages

3. A plant had an average load of 20 MW when the load factor is 50%. Its diversity factor is 20%. The sum of max. demands of all loads amounts to:
 - a. 12 MW.
 - b. 8 MW.
 - c. 6 MW.
 - d. 4 MW.
4. The annual peak load on a 60-MW power station is 50 MW. The power station supplies loads having average demands of 9, 10, 17, and 20 MW. The annual load factor is 60%. The average load on the plant is:
 - a. 4,000 kW.
 - b. 30,000 kW.
 - c. 2,000 kW.
 - d. 1,000 kW.
5. A 100 MW power plant has a load factor of 0.5 and a utilization factor of 0.2. Its average demand is:
 - a. 10 MW.
 - b. 5 MW.
 - c. 7 MW.
 - d. 6 MW.
6. Power transmission through a line is improved by:
 - a. Increasing the line voltage.
 - b. Decreasing the line reactance.
 - c. Both (a) and (b).
 - d. None of these.
7. Load compensation is:
 - a. The control of reactive power to improve quality of supply.
 - b. The control of real power to improve quality of supply.
 - c. The control of voltage and its angle to improve the quality of supply.
 - d. Both (a) and (b).
8. To improve the p.f. of 3- ϕ circuits, the size of each capacitor when connected in delta with respect to when connected in star is _____.
 - a. 1/6th.
 - b. 1/4th.
 - c. 3 times.
 - d. 1/3rd.

The questions are over with my best wishes for success. Dr. Farrag.