



[1] The load factor and different categories of energy consumption in an area are tabulated below:

Year	2007	2008	2009	2010	2011
Industrial Energy (MWH)	906310	889330	884730	1017030	1363850
Traction Energy (MWH)	229440	230660	199760	225940	260690
Domestic Energy (MWH)	57720	60240	68280	89880	119730
Commercial Energy (MWH)	49470	53480	62770	81770	103760
Load Factor %	32.99	32.97	38.1	37.04	45.8

- 1-Using Extrapolation method project the load up to 2015.
 - 2- Using the End-Use method predict the energy and peak load up to 2015. (use the function $Y = a + bx + cx^2$)
- Comment on the results. [25 Marks]

- [2] A. Compare between Thermal, Nuclear and hydro-electric power stations in terms of: site selection, advantages, disadvantages and tariff equations.
- B. Sketch the schematic diagram of a thermal power plant and discuss briefly the function of each part.
- C. Mention some advantages of having load dispatch center
- D. There are four industrial loads with peak demands of 250 MW, 350 MW, 200 MW and 400 MW respectively. It is required to supply these loads from a new power station, with a diversity factor of 1.65 and a load factor of 0.6. Then:
- I- Suggest the type of the required power station
 - II-Suggest the number and the size of the generating units in the power station. As well as the required stand by unit(s)
- Calculate
- III- The installed capacity of the station
 - IV- The annual supplied energy
 - V- If you have an empty area of 150000 m² beside the station, what is the capacity of a new generating unit you can install.

[25 Marks]

- [3] A. Discuss how you can choose
i-generation voltages. ii- - Current limiting reactors locations
iii-transmission voltage and discuss its effect on conductors volume
- B. Mention the civil and electrical steps of substation construction and discuss briefly the considerations which kept in view while finalizing the layout of the substation.
- C. A generating station has two alternators of 20 MVA And 30MVA with Percentage reactances 8 and 10 respectively. Three circuit breakers are Used to protect three loads feeders. Due to increase in load it is intended to extend the system by adding a 20 MVA transformer of 10 % reactance, through a current limiting reactance of 30% to protect the circuit breakers (base power 100MW). Calculate the circuit breakers rating.

[25 Marks]

- [4] A. What is meant by automated expansion of transmission lines.
Discuss the reasons for new transmission expansion.
- B. Mention the different schemes of bus-bar arrangements and Explain two of them with drawing.
- C. Discuss briefly each of the following:
-Power system security – Security control
– SCADA system and its main components

[25 Marks]

Good luck

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