Tutorial -1 (Electrical Energy Management)

1. Consider a storage dam of medium height about 20m above river bed. The dam will store only monsoon flows and non-monsoon flows of the river will be released in the down-stream. It is planned to install a small hydropower plant at the toe of the dam. The 10 daily average discharges of the 75% dependable year are given in Table 1. The gross head during non-monsoon is 13m and during monsoon is 10m. Design discharge may be considered as 37 m^3/s and head loss shall be considered as 0.3m.

Find the installed capacity of the plant and number of units such a way that at least one unit may practically run at minimum available discharge in non-monsoon season. Justify your answer.
Calculate the monthly energy generation (January to December) with the available data in Table 1.
Calculate the plant load factor
Days of full capacity generation in a year

Table 1: DISCHRAGE FOR POWER GENERATION

S.No	Month	Ten day Block	Discharge (m^3/s)	S.No	Month	Ten day Block	Discharge m^3/s
1	January	1 - 10	8.596	7	July	1 - 10	12.173
		11- 20	8.274			11 -20	84.14
		21- 31	9.156			21 - 31	100.45
2	February	1 - 10	8.624	8	August	1 - 10	22.519
		11 - 20	9.219			11 - 20	85.54
		21 - 28	9.002			21 - 31	52.717
3	March	1 - 10	8.421	9	September	1 - 10	86.87
		11 - 20	8.295			11 - 20	255.71
		21 - 31	8.211			21 - 30	26.803
4	April	1 - 10	8.092	10	October	1 - 10	165.76
		11 - 20	7.567			11 - 20	109.62
		21 - 30	6.636			21 - 31	46.963
5	May	1 - 10	5.624	11	November	1 - 10	36.183
		11 - 20	4.545			11 - 20	34.937
		21- 31	4.601			21 - 30	40.229
6	June	1 - 10	5.111	12	December	1 - 10	25.382
		11 -20	5.649			11 - 20	9.051
		21 - 30	5.253			21 - 31	8.484

2. A hydro-electric generating station is supplied from a reservoir of capacity 5×10^6 cubic metres at a head of 200 metres. Find the total energy available in kWh if the overall efficiency is 80%.

3. A minimum run off of approximately 94 m^3 /sec will be available at a hydraulic project with a head of 39 m. Determine (i) yearly gross energy output, (ii) net energy output in million units. Assume the efficiency of the plant to be 80% and forced outage to be 10%.

4. A hydro-electric power station has a reservoir of area 2·4 square kilometres and capacity 5×10^6 m^3. The effective head of water is 100 metres. The efficiency of combined hydraulic, mechanical and electric systems is 80%. (i) Calculate the total electrical energy that can be generated from the power station. (ii) If a load of 15,000 kW has been supplied for 3 hours, find the fall in reservoir level.