



**Faculty of Electrical & Electronics Engineering**  
**BEE3133 Electrical Power Systems**

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**ASSIGNMENT #1**

1. Describe the advantages and disadvantages of radial and ring network in electrical power distribution system.
2. Describe the functions of substation in electrical power system.
3. Define the following terms:
  - Maximum Demand
  - Load factor
  - Plant capacity factor
  - Plant use Factor
  - Utilization factor
  - Diversity factor

4. A power station has to supply load as below:

Time in hours	0-6	6-12	12-16	16-18	18-20	20-24
Load in MW	40	100	120	100	90	80

The power station will shut down 25 days per year for maintenance. Assuming 80% of the plant capacity is the maximum demand, analyze:

- The daily energy production
- The annual energy production
- Daily load factors
- Annual load factor
- The reserve capacity of the plant
- The plant capacity factor
- The plant use factor

[Ans: 2020MWh, 686800MWh, 0.7014, 0.653, 30MW, 0.5, 0.56]

5. A power station has to supply load as follow

Duration (hours)	Load (MW)
12am – 2am	40
2am – 6am	30
6am – 10am	90
10am-12am	100
12pm – 2pm	120
2pm –6pm	100
6pm – 8pm	90
8pm – 10pm	70
10pm – 12am	50

- Plot the load curve.
- Calculate the daily load factor

[Ans: 0.632]

6. A power plant delivers 100 MW from 6 am to 2 pm and 150 MW from 8 pm to 12 am. The power plant will shut down for maintenance in some duration of each year. The energy generated per year is  $335.5 \times 10^3$  MWh. Assuming the 80% of the plant capacity is the maximum demand, analyze:

- Daily energy production
- The actual day of the power plant is operated and the day of power plant is shut down for a year.
- The average load
- The annual load factor.
- The capacity of the power plant.
- The reserve capacity of the power plant.
- The plant use factor.

[Ans: 1400MWh, 240, 125, 38.3MW, 0.2553, 187.5MW, 37.5MW, 0.31]

7. Maximum demand of a generating plant located at Pasir Gudang is 150MW with 55% daily load factor. The plant capacity factor and plant use factor is 55 % and 85 % respectively. Analyze

- daily energy produced
  - installed capacity of the plant
  - reserve capacity of the plant
  - maximum energy that could be produced daily if the plant running all the time
- [Ans: 1980MWh, 150MW, 0, 3600MWh]

8. The daily load data of a substation is given below. Assume the maximum demand to be 80% of the plant capacity.

Duration (hours)	Load (kW)
12am – 2am	900
2am – 6am	800
6am – 9am	3000
9am – 12pm	5000
12pm – 2pm	2000
2pm – 4pm	4000
4pm – 6pm	3500
6pm – 8pm	2500
8pm – 10pm	1500
10pm – 11pm	1000
11pm – 12am	700

Based on the given data,

- Plot the load curve.
  - Calculate the load factor
  - Calculate the reserve capacity of the plant
  - Plant use factor
9. A power station has the following annual load. Calculate total annual energy consumption.

	Industrial
Load factor	0.82
Maximum demand	6000kW

[Ans:  $43 \times 10^3$  MWh]

10. A medium voltage industrial plant having the following data from its monthly bill:

Load Factor	: 60%
Monthly active energy consumption (kWh)	: 216,000 units
Monthly reactive energy consumption (kVarh)	: 220,363 units

Using Tariff E1 - Medium Voltage General Industrial Tariff (TNB), analyze:

- (i) The maximum demand of the consumer.
- (ii) The power factor of the consumer (assume 30 days per month).
- (iii) The total penalty charge due to poor power factor (if any) and the total monthly bill charge for this consumer.
- (iv) The size of capacitor, in Kvar, would raise the PF to be 0.85.

***Tariff E1 – Medium Voltage General Industrial Tariff***

***For each kilowatt of maximum demand per month  
RM/kW 29.60***

***For all kWh  
sen/kWh 33.7***

***TNB Power factor surcharge***

<i>Percent of surcharge from the current bill</i>	<i>Condition</i>
1.5%	<i>For every 0.01 less than 0.85 power factor</i>
3.0%	<i>For every 0.01 less than 0.75 power factor</i>

[Ans:500kW, 0.7, RM26,277.60, RM113,869.60, 120.14kVar]