Tutorial 1 Power System Tariffs

1. Distinguish between the terms Transmission and Distribution as applied to electrical power supply systems. Give an example of each.

2. Explain the meaning of the following terms and discuss their significance within the context of power system tariff.

   (i) Load factor
   (ii) Power factor
   (iii) Diversity factor

3. A consumer requires 100kW at 0.8 power factor for 8 hours/day on 300 days a year, he is offered:

   (i) £14/kW of maximum demand, plus 0.4 pence/kWh, plus 0.12 pence/kVAh, or

   (ii) £14/kVA of maximum demand plus 0.425 pence/kWh

   Which tariff should be accepted?

4. A consumer with a maximum demand of 500kW consumes 4800 units of electricity per day. What is the load factor? If the load factor is improved to 66.7%, what will be the saving on the maximum demand charge if the tariff charge is £8 per kW of maximum demand? The energy used remained unchanged.

5. The maximum demands of all consumers connected to a generating station total 300,000 kW. As these do not occur at the same time a diversity factor of 15 can be applied. WEhat will be the maximum load or rating of the generator? If the capital charge of generating plant id £9/kW, what will be the charge per kW of maximum demand to the consumer?

6. Either of the following tariffs can be adopted for a factory:

Tariff	Supply Voltage	£/KVA annual max.demand	p/k Wh
X	< 650V	27	1.5
Y	> 650V	26	1.3

The factory electrical equipment is 3-phase, 430V having a maximum demand of 500kVA at a power factor of 0.8 lagging.

The cost on one 3-phase, 500-kVA, 6600/430 transformer is £15,000 and the total annual interest and depreciation rate is 15%.

Neglecting the transformer energy losses, calculate the load factor at which the annual cost using tariff X will be equal to that using tariff Y (the consumer providing the transformer).

If the load factor is 0.75, determine the annual saving, which would result from adopting the more economic tariff.

7. Determine the load factor of an industrial concern that has an average daily load shown in the table.

Time (Hours)	0 - 4	4 - 12	12 - 15	15 - 17	17 - 23	23 - 24
Load (MW)	0.2	0.5	1.1	1.2	1.0	0.55

The 2-part tariff applicable to the concern is £6 p.a.per kVA of max.demand and 0.25p/kWh. Calculate the daily cost of the supply and also estimate the daily saving resulting from improving the load factor to 0.8 for the same daily energy and the same power factor at maximum load.

8.0 A consumer has the option of choosing one of the following tariffs for electrical supply.

Tariff	Supply Voltage	Pounds/kVA in Maximum Demand (MD)	Pence/kWh
A	400V	50	4
B	11kV	40	3

The consumer's electrical equipment is 3-phase, 400-V, having a maximum demand of 500kVA at a power factor of 0.8 lagging. The cost of one 3-phase, 500kVA, 11kV/400V transformer is £40,000. The total annual interest and depreciation rate is 15%.

Neglecting the transformer energy losses, determine the most economical tariff at a load factor of 0.5.

9.0 A consumer has the option of choosing one of the following tariffs for electrical supply.

Tariff	Supply Voltage	Pounds/kVA in Maximum Demand (MD)	Pence/kWh
A	400V	50	4
B	11kV	40	3
C	33kV	35	2.5

The consumer's electrical equipment is 3-phase, 400-V, having a maximum demand of 500kVA at a power factor of 0.8 lagging. The cost of one 3-phase, 500kVA, 11kV/400V transformer is £40,000, whilst a 3-phase, 500kVA, 33kV/400V transformer costs £140,000. The total annual interest and depreciation rate is 15%.

Neglecting the transformer energy losses, determine the most economical tariff at a load factor of 0.5.