IQRA National University, Peshawar
Department of Electrical Engineering
Summers
Power Generation

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REG.No: 12395

Time Allowed

Instructor: Engr.Sanaullah Ahmad

Note: Attempt All Questions

Question No 1 *(CLO -1)* **10**

A. What is meant by electricity tariff, explain different classes of tariff with examples?

Question No 2 *(CLO-2)* **10**

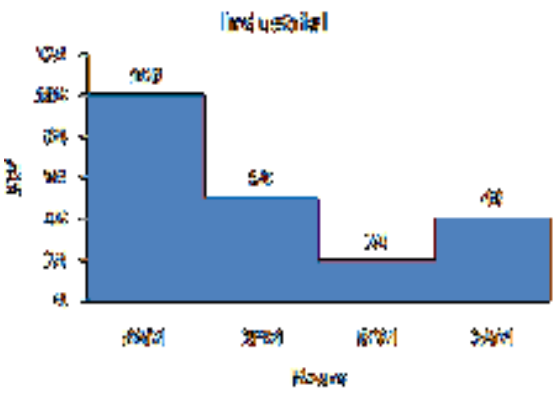
A. A power station has to supply load as follows:

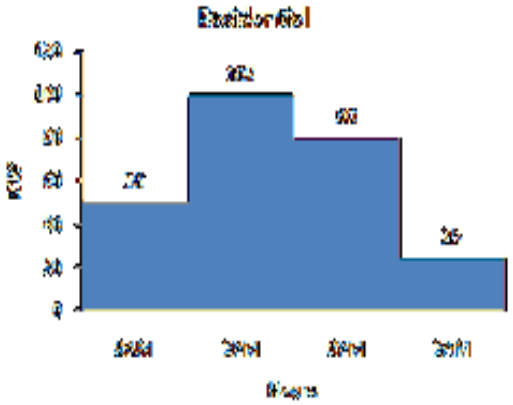
Timings	KW
11 pm to 5 am	500
5 am to 6 am	750
6 am to 7 am	1000
7 am to 9 am	2000
9 am to 12 noon	2500
12 Noon to 1 pm	1500
1 pm to 5 pm	2500
5 pm to 7 pm	2000
7 pm to 9 pm	2500
9 pm to 11 pm	1000

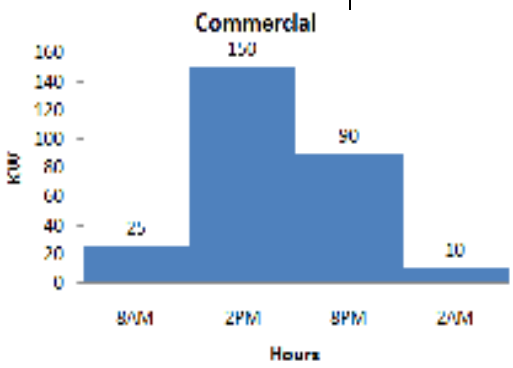
For the given data above draw the load curve. Select the number and size of generator units to supply this load. Find the reserve capacity of the plant required. Calculate the plant capacity factor. Determine the operating schedule of the units in the station. Calculate the plant factor?

Question No 3 *(CLO-2)* **10**

A. For the load Curves of three different classes, given below, Calculate Maximum demand (MD), Load Factor (LF) of each load curve , Quadrants Maximum demand, Diversity Factor (DF) of Each Quadrant, Determine which class contributes more in Peak hour through Class Contribution Factor (CCF) ?







Date: Day M T W T F

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Semester 10th

Subject Power Generation

Teacher Eng Sir Sanaulla

Date 20-08-2020

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Q: No: 01

Ans:- The electricity generated is to be supplied to the consumes. The total cost of generator and profit as to be recovered from the consumer. The rate of energy sold to the consumer as domestic, comercial and industrial.

* Several different factor help determine the electricity teriff that is applied in a given locapity.
* The rates depend upon the total energy consumed and load factor of the consumer.
* The teriff (energy rate) chosen should recover the fixed cost operating cost and profit etc. incurred in generating the electrical energy.
* The power system teriff is charged in a form of bill on monthly basis.

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Types of Tariff:-

* Tariff may be a plain, two or three part.
* Two and three part tariff consist of two components.
* Variable component, based on installed load capicity or maximum demand on both.
* In a plain tariff it is the cost of electricity in term of Kwh (1 unit = 1kwh) actually used by a consumer are changed are charged in the bill and therefore only consists of variable component.
* The units in terms of Kwh are registered by the energy meters installed at a consumer premises.

Classes of Tariff:-

Two Part tariff:-

* Cost of the electricity supplied to consumers may be divided into fixed cost and running cost.

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* Two part tariff consist of fixed and running cost for large power consumer two part tariff is imposed. Fixed cost may vary from consumer to consumer and may based on appliences connect. To supply thus two part tariff is usually have KVA or KW and variable portion based on the amount of electricity units consumed i.e

Tariff = Rs per KVA (KW) + Rs per KWH

Three Part Tariff:-

* Three part tariff consist of fixed part based on KVA or KW variable portion based on KWH and maximum demand which varies depending on habit of use of appliences
* Maximum demand can be obtained from maximum demand indication indicator installed on distribution transformers.

Tariff = Rs per KVA (KW) + Rs per kW maximum demand.

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Q.No : 2

A power station has to supply load as follows.

Timing	KW
11 pm to 5 am	500
5 am to 6 am	750
6 am to 7 am	1000
7 am to 9 am	2000
9 am to 12 noon	2500
12 noon to 1 pm	1500
1 pm to 5 pm	2500
5 pm to 7 pm	2000
7 pm to 9 pm	2500
9 pm to 11 pm	1000

Solution:-

The maximum demand is 2500 KW

Energy generated during 24 hours.

$= (500 \times 5) + (750 \times 1) + (1000 \times 1) + (2000 \times 2) + (2500 \times 3) + (1500 \times 1) + (2500 \times 4) + (2000 \times 2) + (2500 \times 2) + (1000 \times 2) + (500 \times 1)$

$= 38.750$ KWh

Maximum demand = 2500 KW

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$$\text{Load factor} = \frac{\text{Energy generated during 24 hour}}{\text{Maximum demand} \times 24 \text{ hour}}$$

$$= \frac{38.750}{2500 \times 24}$$

Load factor = 64.7 %.

From the nature of load curve it will be seen that this is a load of a small industrials towns well distributed during day and night from the load curve it will also be seen that three generator sets will supply with the following rating.

Two sets each of 1000 kW capicity one set of 500 kW capicity.

The reserve capicity required will correspond to the larged size of the unit in the station. In this case set of 1000 kW will have to be bought and kept as a reserve. The total installed capicity of the station

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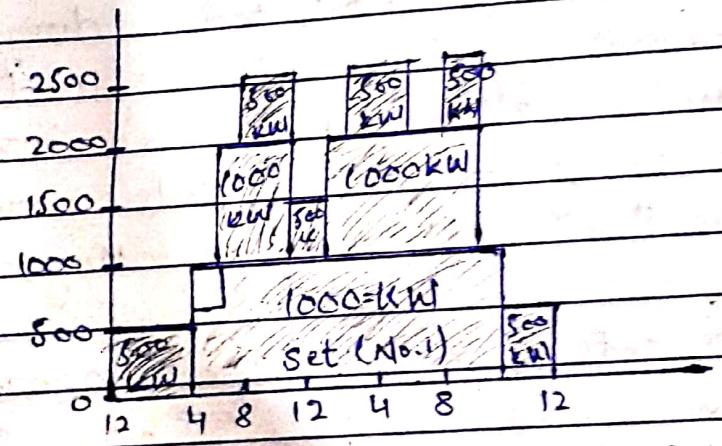
will Therefore be 1000 + 1000 + 500 + 1000 (reserve) i.e 3500kW

Plant capicity factor =

energy Produced during 24hours (kWh)
Installed capicity (kW) x24 hours.

$= \frac{38.750}{3500 \times 24} = 0.46$ or 46%



with the operating shedule fixed as above, the energy that could have been generated by the capicity of plant actually running for the shedule time would be

(500 x 6) + (1000 x 2) + (2000 x 2) + (2500 x 3) + (1500 x 1) + (2500 x 4) + (2000 x 2) + (2500 x 2) + (1000 x 2)

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= 38.750 kwh

plant use factor = $\frac{\text{Energy Produced (kWh)}}{\text{capacity of plant (kW)} \times \text{no of hours plant has been in operate.}}$

= $\frac{38.750}{39,000}$

= 0.994 or 99.4%.

Q: No: 03

Solution:-

Industrial

Maximum demand = 2400

load factor = $\frac{1420}{2400}$ = 0.59

or 59.2 %.

Diversity factor = $\frac{210}{2400}$ = 0.08

or 8.75 %.

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Class contribution factor =

$\frac{100}{2400} = 0.04$ or 4.1%

* Residential:-

Maximum demond = 2400

load factor = $\frac{1470}{2400} = 0.61$

or 61.2%

Diversity factor = $\frac{255}{2400} = 0.10$

or 10.6%

CCF = $\frac{100}{2400} = 0.04$ or 4.1%

* Commertial:-

M.D = 3600

L.F = $\frac{2255}{3600} = 0.62$

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or 62.6%

$$DF = \frac{275}{3600} = 0.075 \text{ or } 7.6\%$$

$$CCF = \frac{150}{3000} = 0.04 \text{ or}$$

4.16%

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