IQRA National University, Peshawar
Department of Electrical Engineering
Spring20
Power Generation
Assignment 1

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Question No 1 *(CLO -1)* **20**

A. A 100kVA distribution transformer costs Rs 2,00,000 and has an estimated useful life of 20 years. Find the annual depreciation amount, assuming that the scrap value of the transformer to be Rs 10,000.

B. The average demand of a consumer is 40 A at 230 volts at unity power factor His total energy consumption annually is 10,000 KWh. If the unit rate is Rs 2 per kWh for the first 500hours use of the demand per annum plus Re 1 for each additional units, Calculate the annual bill of the consumer and equivalent flat rate.

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?

"Power Generation"

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Q① Ⓐ A 100k distribution transformer costs Rs 2,00,000 and has an estimated useful life of 20 Year find The annual depreciation amount assuming That The scrap value of the transformer to be Rs 10,000

Solution

Given Data

$P = 200000$

$S = 10,000$

$N = 20$ Year

Solution

As we Know That,

$$\text{Depreciation } D = \frac{(P-S)}{n}$$

$$= \frac{2,00,000 - 10,000}{20}$$

$$= \frac{190,000}{20}$$

$= 9500$ annually.

Ans.

(B)

Given Data

Energy = $E = 10{,}000$ kWh.

$I = 40A$

$V = 230V$

Solution

As we know that

$P = VI\cos\theta$

$= 230 \times 40 \times 1 = 9200W$

$= 9.2kW$

Electrical consumption for the first 50 hours

50×92

$= 4600$ kWh

Since the cost of electricity is Rs 2 per kwh of for the first 500 hours therefore the consumer has to pay.

4600×2

$= 9200$

for the remaining unit. That is $(10000 - 4600) =$

$= 5400$

Consumer has to pay 5400×1 Rs 5400

Annual bill is therefore: $9200 + 5400 = 14600$ Rs

The flat rate equivalent is $\frac{14600}{10{,}000} = 1.46$ Per kwh.

Q.no 02
Ans (A)

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

Solution:

figure is a load curve plotted from the above data. The max demand is 2500 kW. If water resources were not available is the vicinity. The plant would normally by diesel-electric. for a privately owned plant is could be a steam station if local condition were suitable. The method and considerations for the selection of size of generation units are however common to all types of stations so far a fitting in the load curve is connecned

Energy generated during 24 hour

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

$= 38750$ kWh

Maximum demand = 2500 kW

Load factor = $\frac{\text{Energy generated during 24h}}{\text{Max demand} \times 24\text{h}}$

$= \frac{38{,}750}{2500 \times 24}$

$= 64.7\%$

for The nature of load curve it will be seen That is The load of a small Industrial town well distributed during day and night. from The load curve it will also be seen That Three generator sets will suffice will The following ratings

Two set each of 1000kw capacity

one set of 500kw capacity

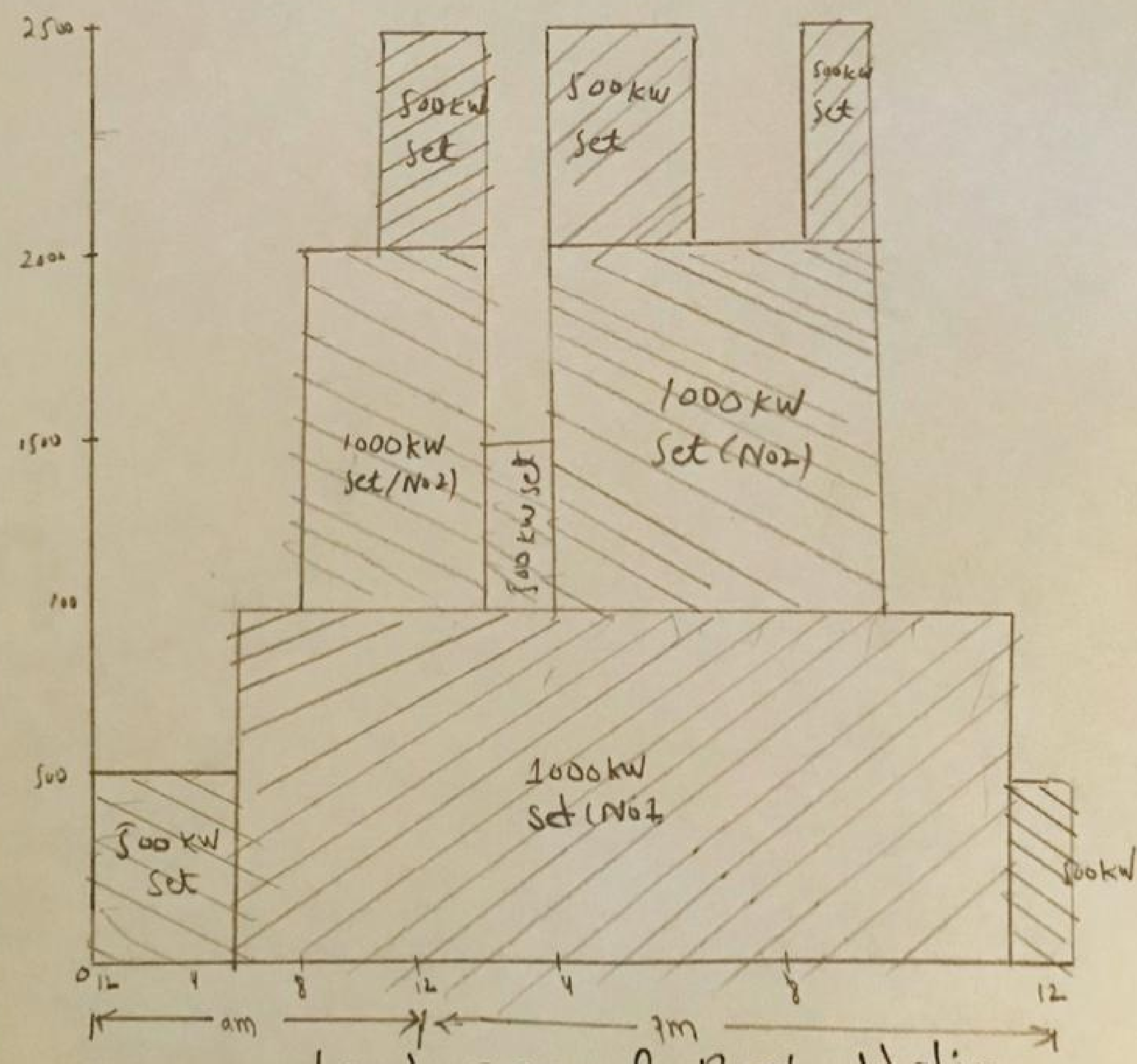
The reserve capacity required will correspond to The largest size of The unit in The station In This case a set will of 1000kw will have too be bought and kept as reserve. The total installed capacity of the station will therefore be 1000 + 1000 + 500 + 1000 (reserve) i.e = 3500kw

$$\text{Plant Capacity factor} = \frac{\text{Energy Produced during 24h (kwh)}}{\text{Istalled Capacity (kw)} \times 24 \text{ hours}}$$

$$= \frac{38750}{3500 \times 24} = 0.46$$

$$= 46\%$$

Fig



Load Curve of Power Station.