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

Name: ________________

REG.No:_______________

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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?

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"Question No 1"

Part(a) Sol:

Given data:

P = 2,00,000
S = 10,000
N = 20 years.

Depreciation $D = (P-S)/N$

$= \frac{200000 - 10000}{20}$

⇒ Rs 9500 Annually.

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Part (B) sol:

Given data:

Energy: E 10000 KWh.
Current: I 40 A.
Voltage: V - 230 Volts.

The power demand of consumer is
$P = VI\cos\theta = 230 \times 40 \times 1 = 9200W$
or 9.2KW.

The Consumer has to pay for the first 500 hours,

$4600 \times 2 = Rs\ 9200.$

For Remaining unit i.e (10000 - 4600) has to pay

$5400 \times 1 = 5400\ Rs$

Annuall bill is $= 9200 + 5400$
$= Rs\ 14600$

The flate rate equilent is

$= 14600 / 10000$

$= Rs\ 1.46$ Per KWh.

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Question No: 2

(A) Solution: The maximum demand is 2500KW.

⇒ Energy generated during 24 hours.

= (500x5) + (750x1) + (1000x1) + (2000x2) + (2500x3) + (1500x1) + (2500x4) + (2000x2) + (2500x2) + (1000+2) (500x1).

= 38750 KWh.

Maximum demand = 2500 KW.

$$\text{load factor} = \frac{\text{Energy generated 24 hours}}{\text{Maxi demand} \times 24 \text{ hours}}$$

$$= \frac{38750}{2500 \times 24}$$

= 64.7%

From the nature of load curve, it will be seen that this is the load of a small industrial town.

Two sets each of 1000 KW will have to be bought and kept as reserve. The total installed capicity of the station will be

1000 + 1000 + 500 + 1000 (Reserve)

i.e 3500 KW.

Plant Capicity factor = $\frac{\text{Energy Produced (24 hrs)}}{\text{Installed Capicity (kw)} \times 24 \text{hrs}}$

$\Rightarrow \frac{38,750}{3,500 \times 24} = 0.46$ or 46%.

The Capicity of individual sets is chosen as possible to fit. The arrangment is known as operating schedule. In this curve is taken to see the plant of require capicity The capicity of plant might be larger than neccssory.

The operating schedule can be follow by following arrangment.

⇒ From 11 p.m to 5am only 500kw set is run.

⇒ At 5 am load is increased and 100 kw set is run, parallel with 500kw. from 5 am to 7 am.

⇒ After 7 am when load increased second 100kw set starts parallel with first one from 7 am to 9 am.

⇒ At 9 am more load is expected to increase 500KW set is started parallel with other set. During maximum load supplying b/w 9 am to 12 noon, all three sets are running

From 1 pm to 5 p.m this set run again along with two others.

A 5 pm load drops again. The load on the 500KW is removed and this set take out of comission.

From 5 pm to 7 pm only two 1000 KW sets are running.

At 7 pm load increases, owing to lighting all three set run until 9.pm.

After 11 p.m only 500KW set is running.

At time of change over care to be taken to ensure correct parralleling and load transfer.

Scheduled time would be

(500x6) + (1000x2) + (2000x2) + (2500x3) + (1500x1) + (2500 x4) + (2000 x 2) + (2500 x2) + (1000 x2) = 39000KW.

Energy actuall produced = 38750KW.

Plant use for = $\frac{\text{Energy Produced}}{\text{Capacity of plant (KW) x No of hrs plant is in operation}}$

$\Rightarrow \frac{38750}{3900}$

$\Rightarrow 0.994$ or

$\Rightarrow 99.4\%$

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