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

Name: Irshad Khan

REG.No: 12403

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?

Name => Irshad Khan
ID => 12403.
Engr Sanaullah

Subject => Power Generation

Q1 (A) A 100 KVA distribution transformer cost Rs. 200000 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.

Given

$P = 200000$

$S = 10000$

$N = 20$ Years

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

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

$= 9500$ annually

x———x———x———x———x

(B) The average demand of a consumer is 40A at 230 volts at unity power factor his total energy consumption annually is 10000 KWh. If the unit rate is Rs 2 per KWh for the first 500 hours use of the demand per annum plus Rs 1 for each additional units

Name Irshad Khan ID 12403

Calculate the annual bill of the consumer and equivalent flat rate.

Given :-

Energy = E 10000 KWh

Current = I 40 A

Voltage = V 230 volts.

The power demand of the consumer is

$P = VI \cos\phi$

$= 230 \times 40 \times 1$

$= 9200 \ W$

$= 9.2 \ KW$

Consumption for the first 500 hours.

$= 500 \times 9.2$

$= 4600 \ KWh$

Since:

Cost of the electricity is Rs 2 per KWh of for the first 500 hours

Therefore

the consumer has to pay.

$= 4600 \times 2$

Rs = 9200 Rs

Name ⇒ Irshad Khad ID = 12403

For the remaing unit

That is = 10000 − 4600

= 5400

Consumer has to pay

5400 x 1

5400 Rs.

Annual bill is therefore

= 9200 + 5400.

= 14600 Rs.

The flat rate equivalent is.

14600/1000.

= Rs. 1.46 per KWh.

x———x———x———x———x

Q2.

(A) 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

Name Irshad Khan ID - 12403

Timing	KW
12 noon to 1 pm	1500
1 pm to 5pm	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 ~~of~~ to supply this load Find the reverse capacity of the plant. required. Calculate the plant capacity factor. Determine the operating schedule of the unit ~~s~~ in the station. Calculate the plant factor?

Solution

Energy generated during 24 hours:

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

$= 38.75$ KWh

Name Irshad Khan ID => 12403

Maximum demand = 2500 kW

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

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

$= 64.7\%$

from the nature load curve it will be seen that this is the load of a small Industrial town well distributed during day and Night. From the load curve it will be seen that three generator set will suffice with the following ratings

Two set each of 1000 kW Capacity
one set of 500 kW Capacity

The ~~res~~ reseve capacity required will correspond to the largest size of the unit in the station In this case a set of 1000 kW will have be bought and kept as reserve. The total

Name Irshad Khan ID => 12403

installed capacity of the satation will therefore be

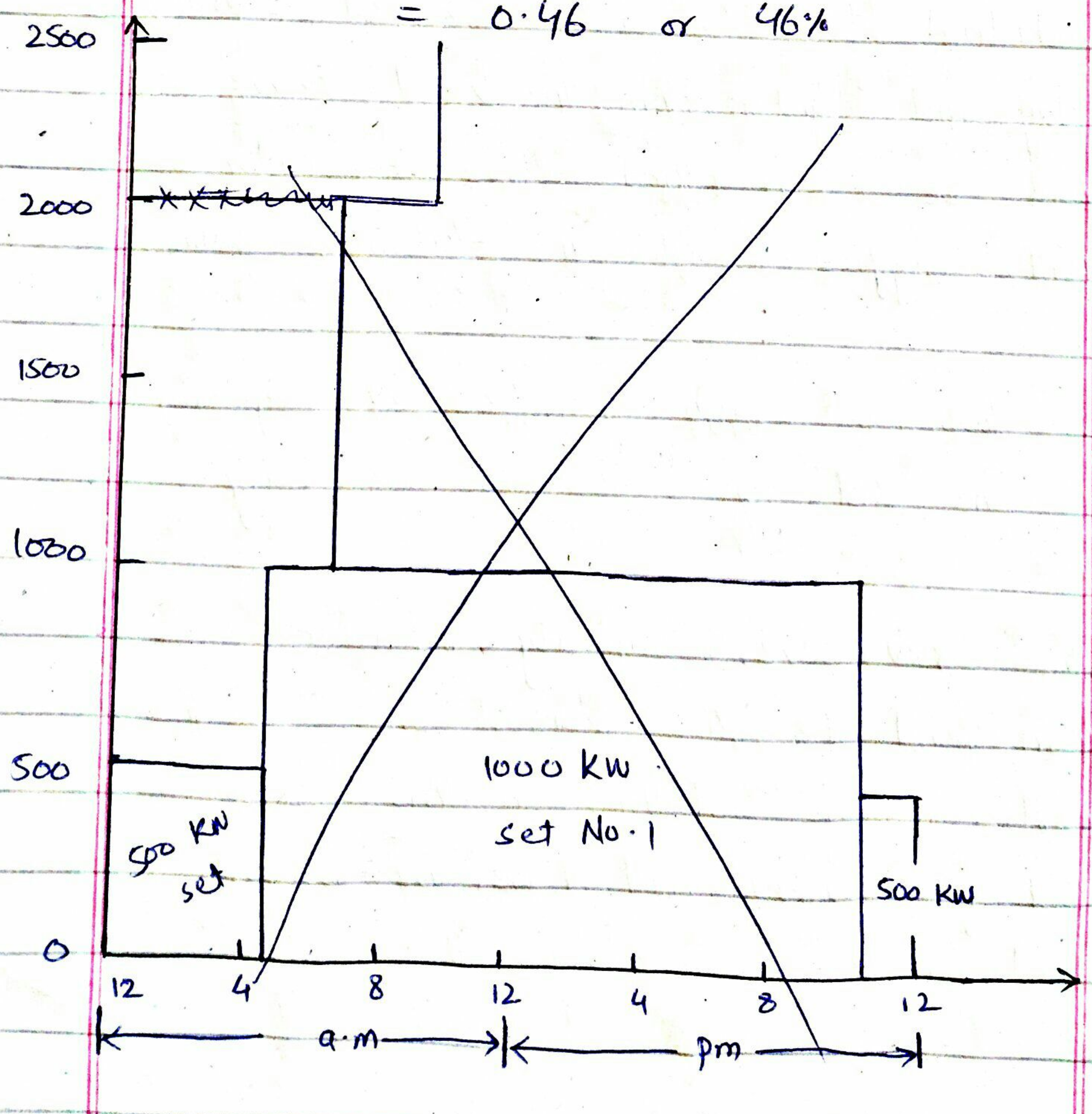
1000 + 1000 + 500 + 1000 (resere)

i.e 3500 KW

Plant capacity factor = $\frac{\text{Energy produced during 24h (kWh)}}{\text{Installed Capacity (KW)} \times 24h}$

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

$= 0.46$ or 46%



Name Irshad Khan ID = 12403

Load Curve power station.