***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 :- 01:-
## Part :- (a):-

**Given data:-**

P = 200,000 , S = 10,000

N = 20 years

Depreciation:- ?

**Solution:-**

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

$$D = \frac{200{,}000 - 10{,}000}{20}$$

D = 9500 annually.

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# Question: 01 :-
## Part :- (b):-

**Solution:-**

energy = E = 10,000wb

Current = I = 40 A

voltage = V = 230V

The power demand of consumer is $P = V.\cos\theta = 230 \times 40 \times 1$

$P = 9200W$ or $9.2 Kw$

Electricity consumption for the first 500 hours is =>

=> 500 x 9.2 => 4600 Kw

Since the cost of electricity is Rs 2 per Kw & for the first 500 hours therefore for consumer has to pay :-

5400 x 1 = Rs 5400

Annual bill = 9200 + 5400

= 14,600

The flate rate equivalent =>

14600/10,000 => 1.46 per kwh

**Question: 02:-**

**Part:- (a):-**

**Solution:-**

Energy generated during 24 hours

=> (500 x 5) + (750 x 1) + (1000 x 1)

+ (2000 x 2) + (2500 x 3) + (1500 x 1)

+ (1000 x 2) + (500 x 1)

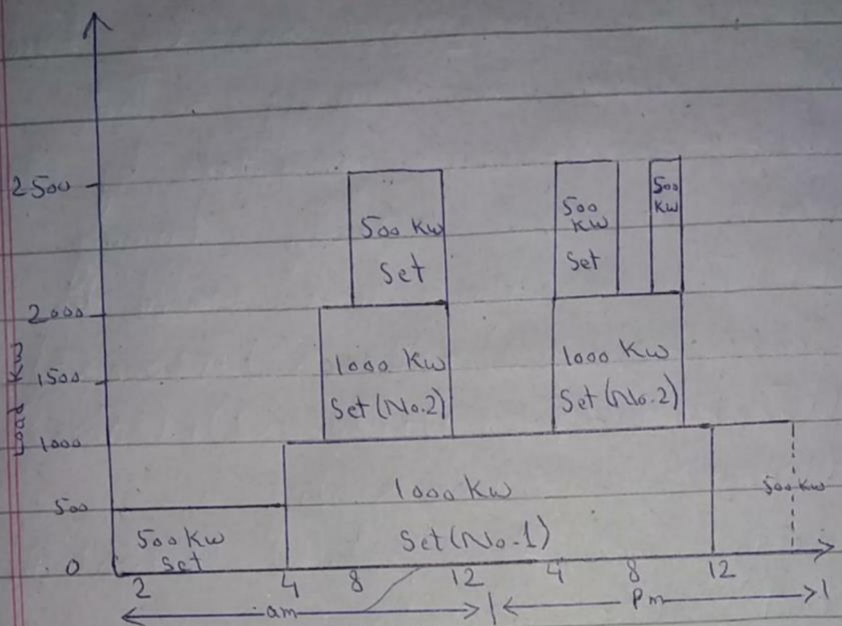
= 38,750 Kw

Maximum demand = 2500 kw

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

= 38750 / 2500 x 24

=> 64.7%




Plant capacity factor = $\frac{\text{Energy produced during 24 hours (kWh)}}{\text{Installed capacity (kW)} \times 24 \text{ hours}}$

Two sets each of 1000 KW
one set of 500 KW
In this case a set of one thousand KW will have to be brought and kept as reserve.
The total installed capacity of solution is = 1000 + 1000 + 500 + 1000 (reserve)
= 3500 KW
Plant capacity factor =
⇒ 38750 / 3500 × 24
⇒ 0.46 or 46%

with the operation sheduled fixed as above the energy that could have been generated by the capacity of plant actually running for the shaduled time would be

$(500\times6)+(1000\times2)+(2000\times2)+(2500\times3)$
$+(1500\times1)+(2500\times4)+(2000\times2)+(2500\times2)$
$+(1000\times2) = 39000$ Kwh

⇒ Energy actually produced = 38,750 Kwh

Plant use factor:-

$$\Rightarrow \frac{\text{Energy produced (Kwh)}}{\text{Capacity of plant (Kw)} \times \text{number of hours plant has been in operation}}$$

$$\Rightarrow \frac{38750}{39000}$$

$\Rightarrow 0.994$ or $99.4\%$