Power distribution & Utilization

Lab No 3

objective :-

The main objective of this lab is to:-

1:: Calculate house load
2:: Selection of cable
3:: Selection of Circuit Breaker.

→ Suppose we have 2 rooms and 1 Kitchen.
→ we will calculate the load seperately for each room.

Room 1 Load Calculation:-

1:: 1 ceiling Fan = 1×80w = 80w
(80w)

2:: 4 Energy Saver = 4×25 = 100w
(25w each)

3:: 1 Electric Iron = 1×1000w = 1000w
(1000w)

4:: outlets load = Stand fan, laptop charger, mobile charger etc = 200w.

Total load of Room 1 =
80+100+1000+200 = 1380w

→ Now, it is possible to increase the load in future
→ Suppose the increase is 20% of the total load:

20% Additional load = $\frac{1380 \times 20}{100} = 276W$

Now total load = 1380 + 276 = 1656W

Now calculating the current:

$$I = \frac{P}{V}$$

$$I = \frac{1656}{220} = \boxed{7.52A}$$

Room 2 Load Calculation:-

i:- 1 Air conditioner = 1 × 1650 = 1650W
ii:- Room Heater = 1 × 1500 = 1500W

→ Remember that these 2 appliances are not used at the same time.
→ We will calculate load on the basis of air conditioner as it takes double current for a few seconds i.e starting.

→ So $I = \frac{1650}{220} = 7.5A$

$7.5 \times 2 = 15A$ (starting current for AC)

As air conditioner is an inductive load so we will also consider power Factor.

$P = V I \cos\phi$

$I = \frac{P}{V \cos\phi} = \frac{1650}{(220 \times 0.95)} = 7.8A$

$7.8 \times 2 = 15.6A$

Kitchen Load:-

we take kitchen load equal to room 1 load:-

So $I = 7.5A$.

Other Load:-

i:- 2 Greyzer (1200w each) $= 2 \times 1200 = 2400w$

$I = 2400/220 = 10.90w$

2:- Water pump (1HP) $= 1 \times 746 = 746w$

$I = \frac{746}{220 \times 0.95} = 3.56A$

As it also takes double current in Starting. So:-

$I = 3.56 \times 2 = 7.12A$

Selection of cable and Circuit Breaker:-

For Room 1:-

$I = 7.5\,A$

So i) Cable Size = 2.5 mm

ii) ckt breaker = 10A

For Room 2:-

$I = 15.6\,A$

So i) Cable size = 4 mm

ii) ckt Breaker = 20A

(Suppose if we select 2.5 mm cable which can take current upto 18A, then it might not be suitable because if we change this AC which might take more than 18A, then it might get burned)

Kitchen load:-

$I = 7.5\,A$ (Same as room 1)

i) Cable size = 2.5 mm ii) CB = 10A.

Water Heater load :-

$I = 10.90A.$

i) :- Cable size = 2.5mm

ii) :- CB = 16A.

water pump :-

$I = 7.12A$

i) :- Cable size = 2.5mm

ii) :- CB = 10A.