# Computer Aided Electrical Drawing. ①

## Auto CAD. —* Commands *—

* **Line Command ⇒** Line Command is used to allow certain a line, while the end points are specified by 2 dimensions or dimensions co-ordinates.

To draw a continous line arrangement we make specified the point or Fix the point with the help of mouse

* **Ex ⇒** Command : Line ↵
* specified 1st point : pick (use of mouse gives the points)
* specified next point : pick
* specified next point : close ↵

The line can be drawn by co-ordinate system and they are classified as

i) Absolute co-ordinate system

ii) Reactive co-ordinate system ⇒

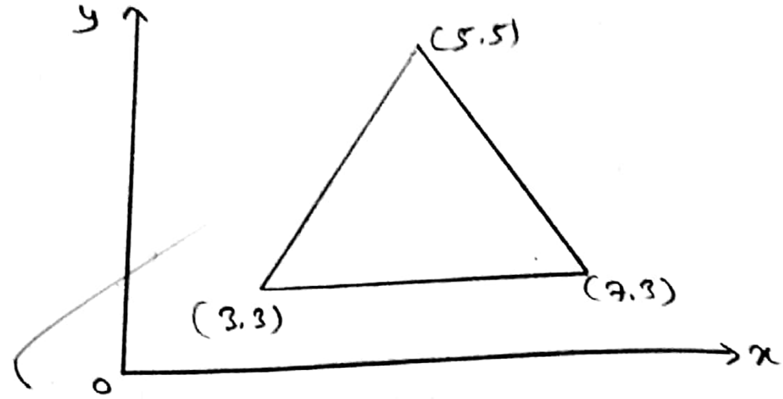
a) Reactive rectangular co-ordinate system [@ x. dist, y dist]

b) Reactive polar co-ordinate system [@ dist, ∠angle].

* **Absolute co-ordinate system ⇒**

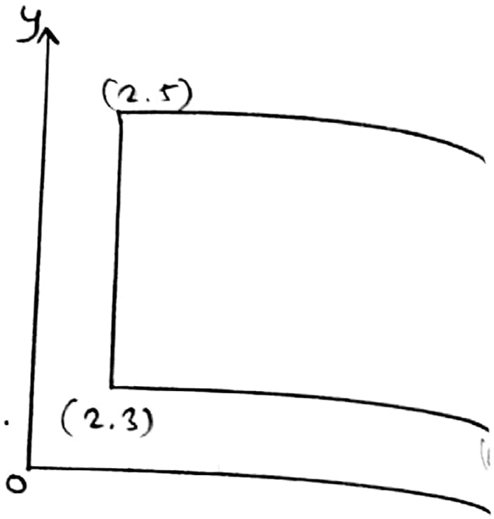
It is specified by given the values of x & y. The following sequences of co-ordinates to draw a tringle & reatangle as shown below

Command : L ↵
Specified 1st point : 3, 3 ↵
specified next point : 7, 3 ↵
specified next point : 5, 5 ↵
specified next point : C ↵




* Rectangular ⇒

Command : L ↵
Specified 1st point : 2.3 ↵
Specified next point : 6.3 ↵
Specified next point : 6.5 ↵
Specified next point : 2.5 ↵
Specified next point : C ↵

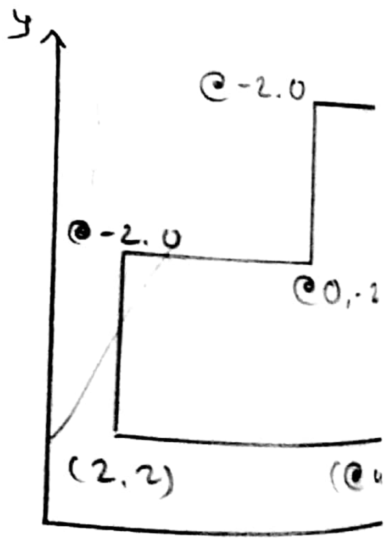



* Reactive Rectangular Co-ordinate system ⇒

Here relative co-ordinate when you know the possible point with respect to previous, the relative rectangular co-ordinate is represen as ⇒

Command : L ↵

Specified 1st point : 2, 2 ↵
Specified next point : @ 4, 0 ↵
Specified next point : @ 0, 4 ↵
Specified next point : @ -2.0 ↵
Specified next point : @ 0, -2 ↵
Specified next point : @ -2. 0 ↵



## * Relative Polar Co-ordinate system →

In this polar system we distance & an co-ordinate with reference to the previous point to locate a point "t" angle are measured in anticlockwise direction. Polar system represented as [ @ distance, angle ]

* Ex ⇒ Command : L ↵

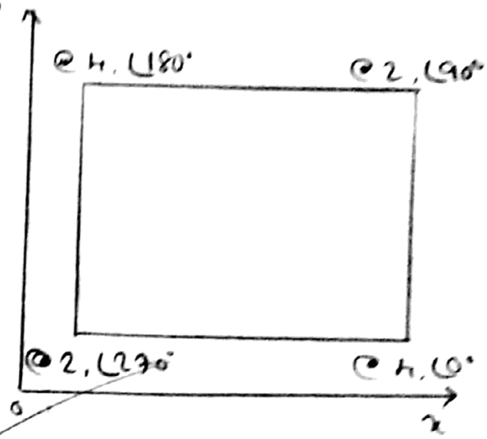
specified 1st point : 2, 3 ↵

specified next point : @ 4, ∠0 ↵

specified next point : @ 2, ∠90 ↵

specified next point : @ 4, ∠180 ↵

specified next point : @ 2, ∠270 ↵




* Hexagon ⇒

Command : L ↵

specified 1st point : (2, 2)

specified next point : @ 3, ∠0 ↵

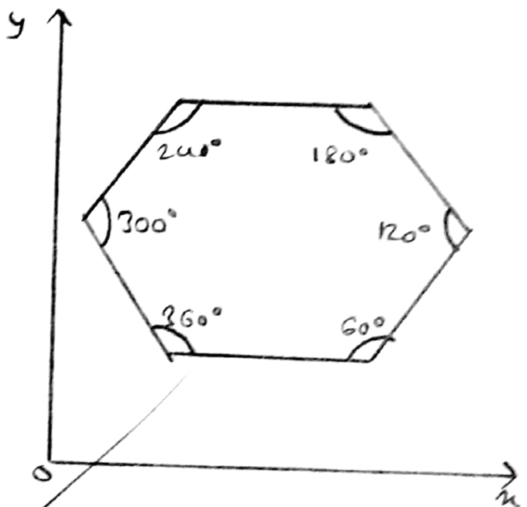
specified next point : @ 3, ∠60 ↵

specified next point : @ 3, ∠120 ↵

specified next point : @ 3, ∠180 ↵

specified next point : @ 3, ∠240 ↵

specified next point : C ↵




* Circle ⇒ Circle can be created in auto cad by several methods. the default method is to specified a centre & radius.

* Ex : command : C ↵

specified the centre point < 2p, 3p, ttr) : 3p

specified 1st point in the circle : Pick P1 ↵

specified 2nd point in the circle : Pick P2 ↵

specified 3rd point in the circle : Pick P3 ↵

* **Break** ⇒ The break command is used to breaks the circuits or lines.

* **Array** ⇒ i) Rectangular Array
ii) Polar Array.

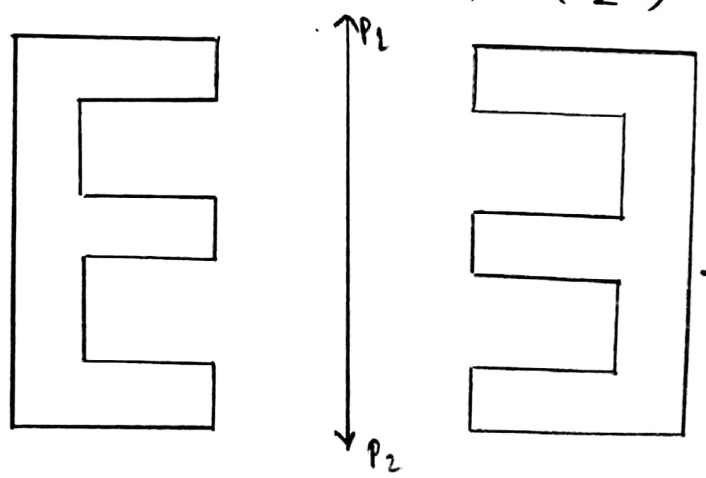
when we used to make multiple copies object but at mutual copy command is little combersion Array command is comes a hardly includes situations It displayed and array dialogs where we set a number of rows , no. of columns etc.

* **mirror** ⇒

Sometimes we need to creates objects that are symmetric about aparticular axis in such cases mirror command is used.

we can draw one half of the model & auto cad processed other half of the mirror, This way you can reduced your effort.

* **Ex** :- Command : mirror ↵
Select the object : By window ↵
Specify 1st point in the mirror line : Pick P1
Specify 2nd point in the mirror line : Pick P2
Select square object < Y/N) < Z > : ↵

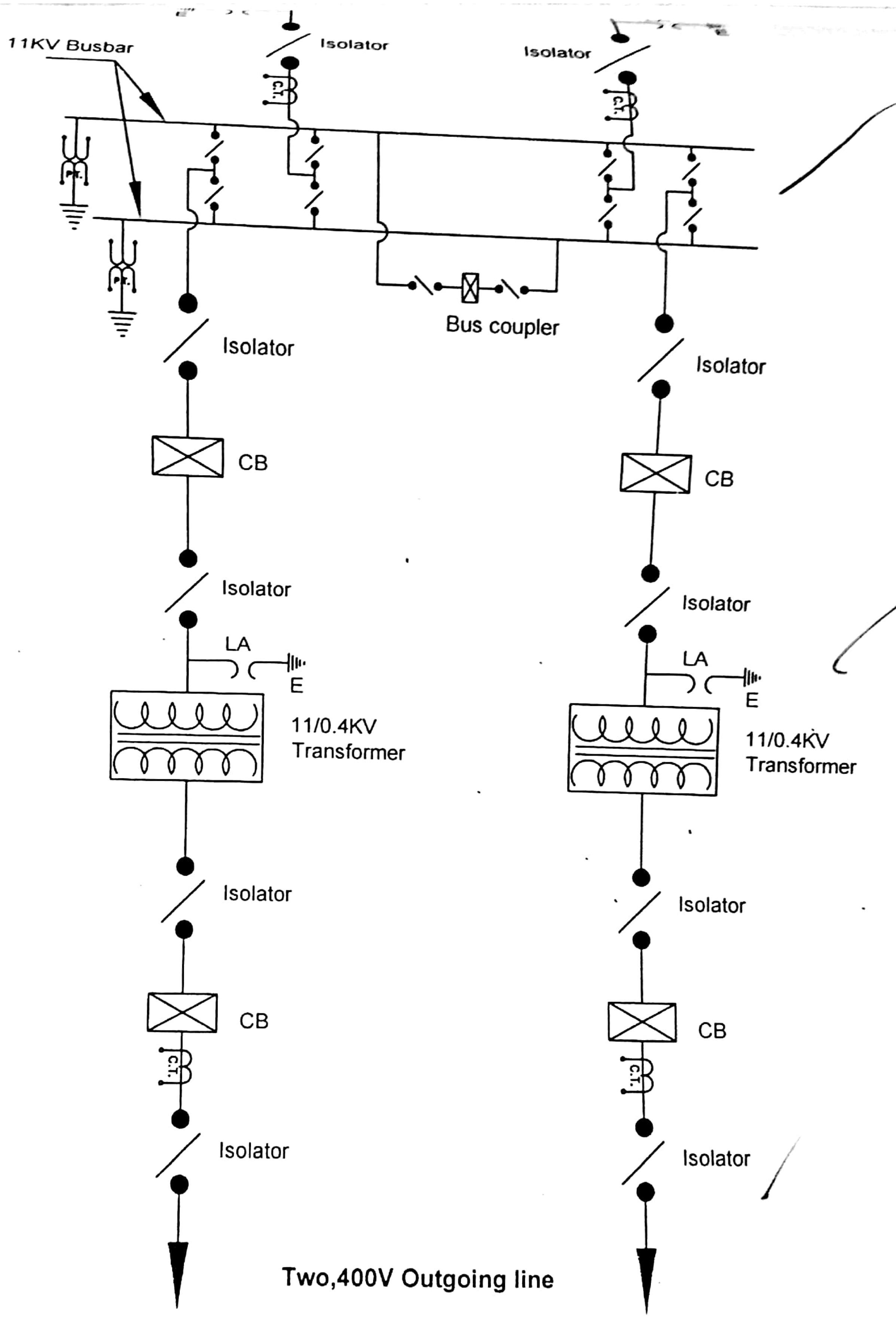


5

1) Draw a Single line diagram with following accesories →

i) 2, 11 kv incoming lines connected to the busbars through circuit breakers and isolators.

ii) Two 400V outgoing lines are connected to the busbars through transformer of 11kv / 400V.


11KV Busbar
Isolator
Isolator
C.T.
C.T.
P.T.
P.T.
Bus coupler
Isolator
Isolator
CB
CB
Isolator
Isolator
LA
E
LA
E
11/0.4KV
Transformer
11/0.4KV
Transformer
Isolator
Isolator
CB
CB
C.T.
C.T.
Isolator
Isolator
Two,400V Outgoing line

) Draw a single line diagram of a typical substati[on]
at the following demands ⇒

i) Two transformers 66 kV / 11 kV, 3 ∅, 5 MVA Δ - Δ connected

ii) one auxilary station transformer 11 kV/400V, 3-∅, 500 kVA, Δ - Y connection

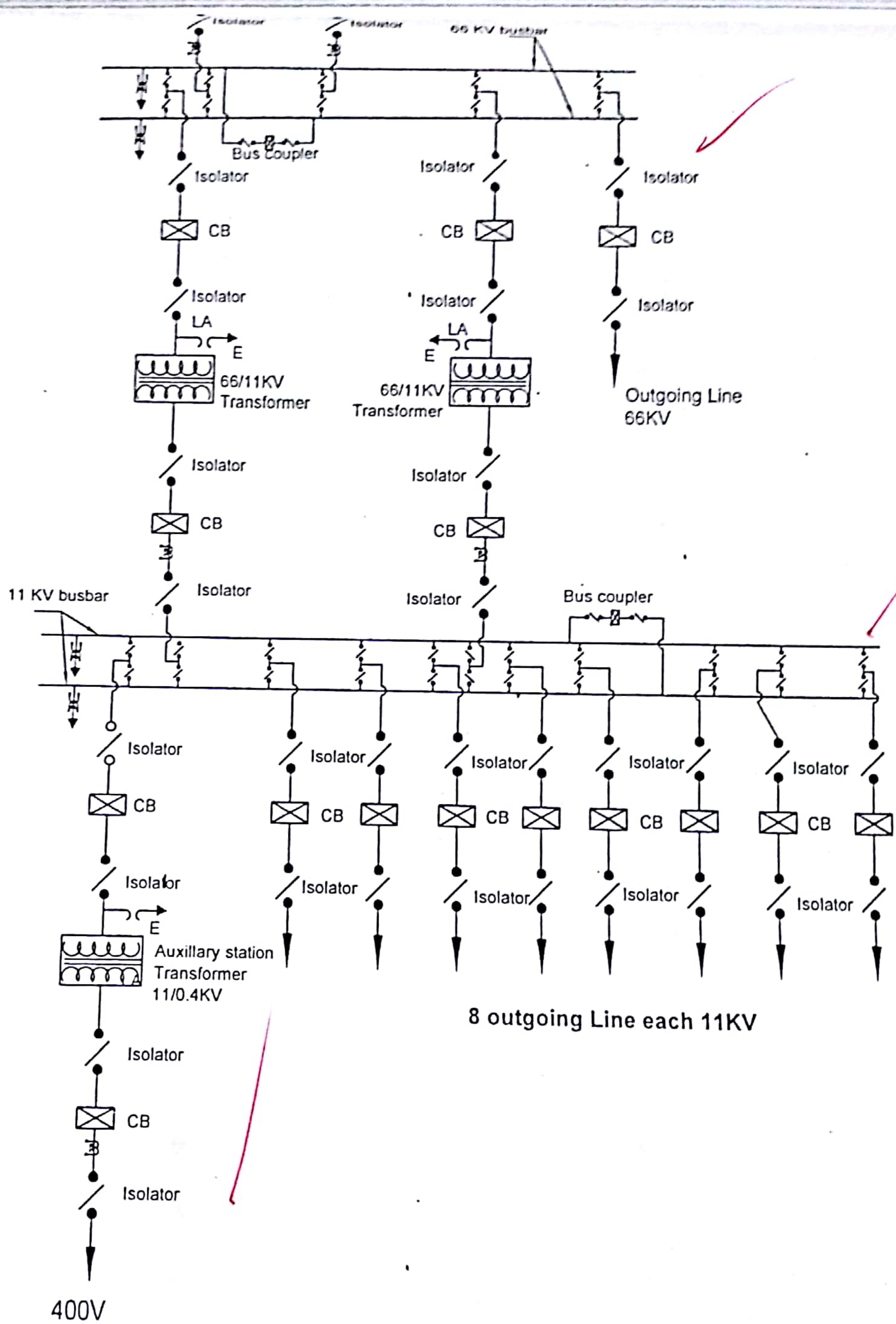
iii) Two incoming lines of 66 kV

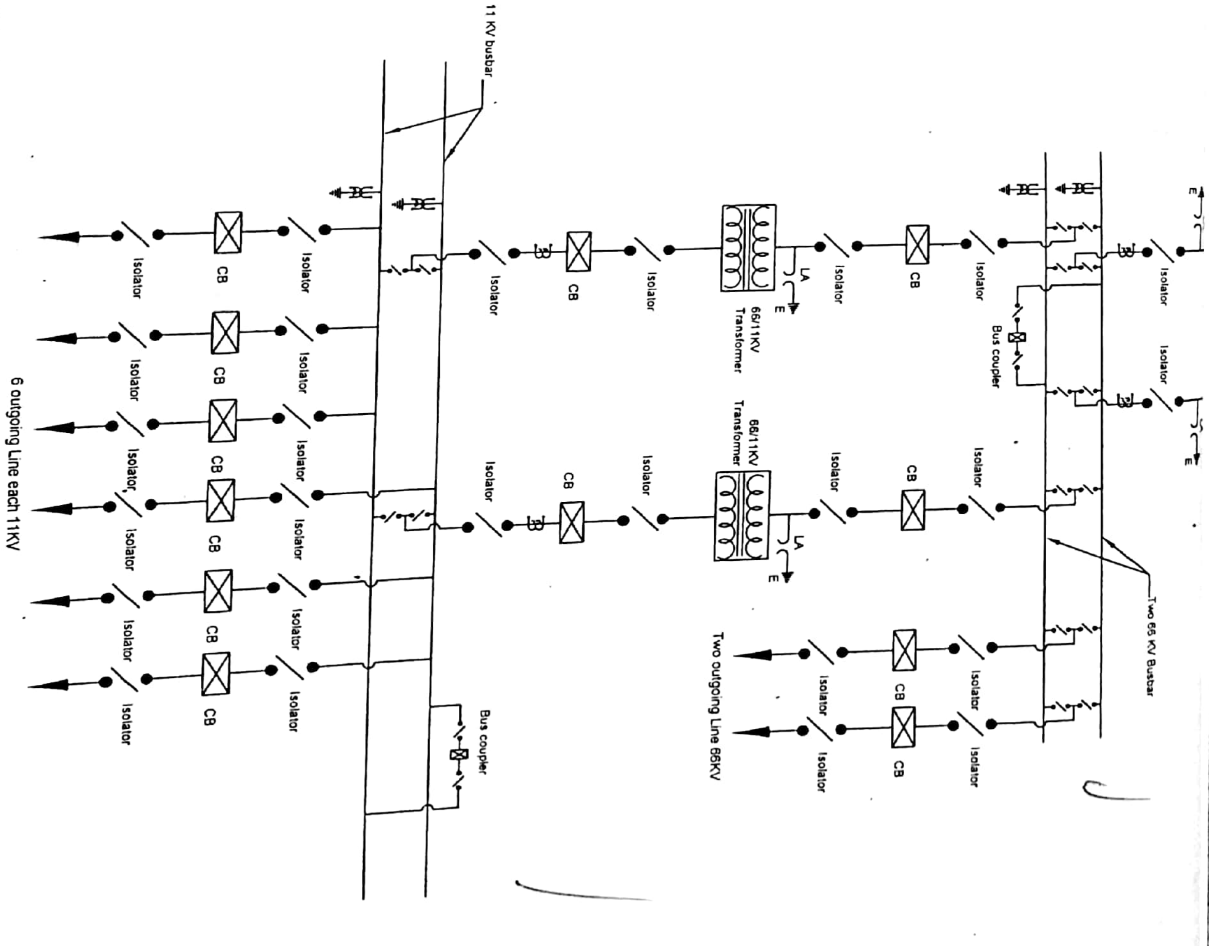
iv) One outgoing line of 66 kV

v) Eight outgoing lines of 11 kV

Arrange the buses, CB's, disconnecting switche[s],
CT's, PT's & also shows the lightning arresters.

Scanned by CamScanner


Isolator
Isolator
66 KV busbar
Bus Coupler
Isolator
CB
Isolator
LA
E
66/11KV
Transformer
Isolator
CB
Isolator
LA
E
66/11KV
Transformer
Isolator
CB
Isolator
CB
Isolator
Outgoing Line
66KV
11 KV busbar
Isolator
Isolator
Bus coupler
Isolator
CB
Isolator
E
Auxillary station
Transformer
11/0.4KV
Isolator
CB
Isolator
400V
Isolator
CB
Isolator
Isolator
CB
Isolator
Isolator
CB
Isolator
Isolator
CB
Isolator
8 outgoing Line each 11KV




Draw a single line diagram of 66 kv/11kv line having fallowing data →

i) Two 66 kv incoming lines.

ii) Two busbars of 66 kv

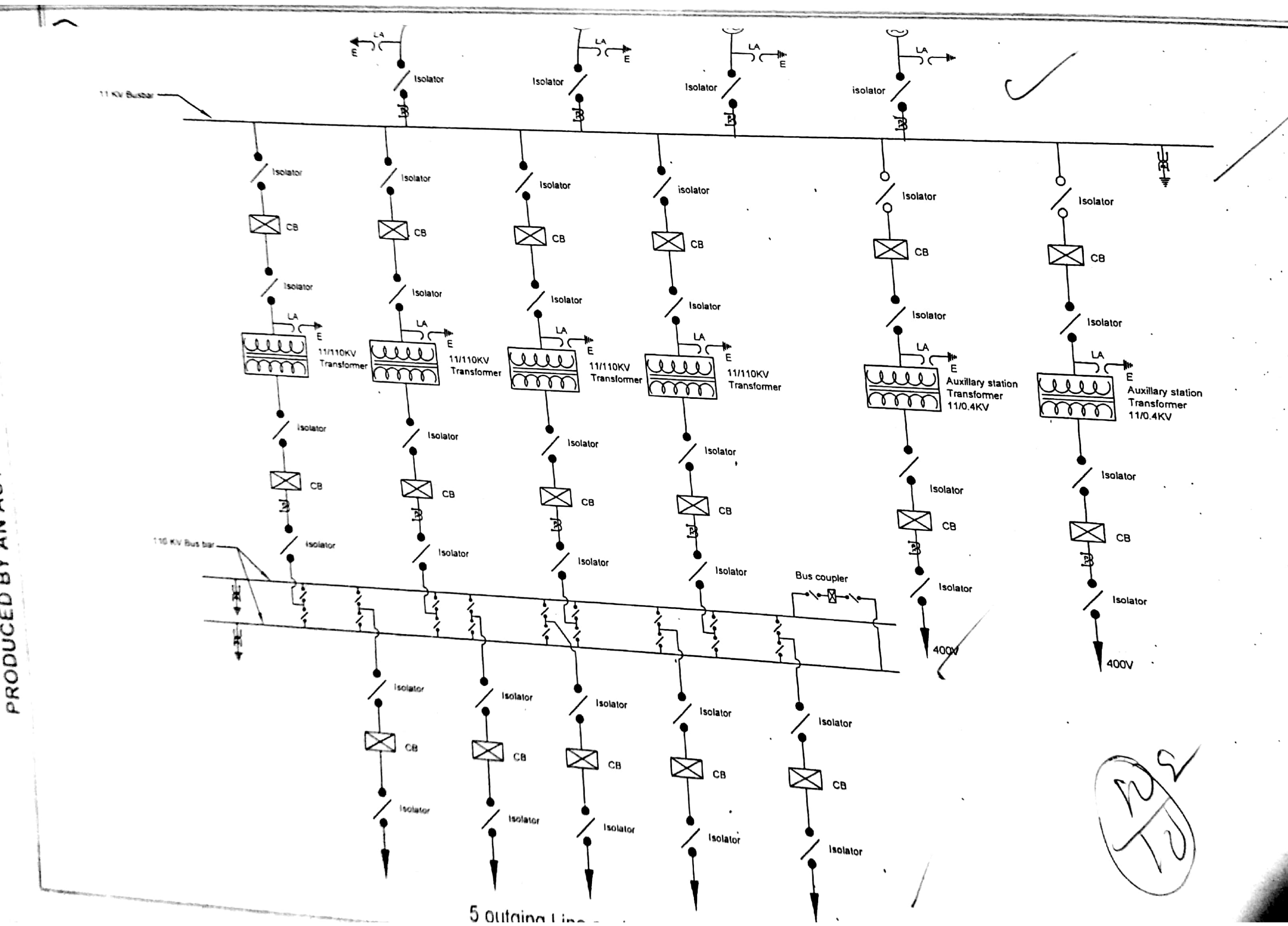
iii) Two outgoing lines of 66 kv

iv) one bus coupler of 66 kv of OCB

v) Two xtransformers of 66 kv/11 kv, Y-Y connection.

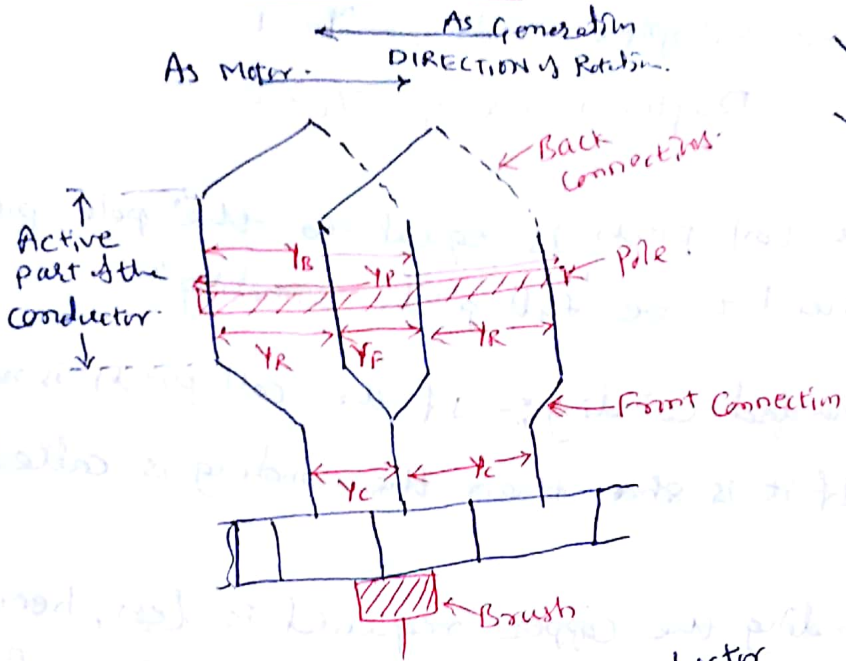
vi) Two 11 kv busbars each having three 11 kv outgoing lines & one coupled with bus coupler.

shows the CT, PT, lightning arrestor in a appropriate positions.


11 KV Busbar
Isolator
CB
LA
E
11/110KV Transformer
Auxillary station Transformer 11/0.4KV
110 KV Bus bar
Bus coupler
400V
5 outgoing Line

# WINDINGS.

## DC Armature Windings:




$Y_F \rightarrow$ Front Pitch

$Y_B \rightarrow$ Back pitch.

$Y_C \rightarrow$ Commutator Pitch.

$Y_R \rightarrow$ Resultant pitch.

$Y_P \rightarrow$ Pole pitch.

**POLE PITCH:—** Number of ~~poles~~ conductor under the poles. or no. of conductors per pole is known as pole pitch.

Ex:- If 24 conductors in a armature & with 4 pole. Then pole pitch $= \frac{24}{4} = 6$

**Front pitch:-** The ~~conductor~~ distance covered by the front end connections in terms of conductors. It is called front pitch & it is denoted by "$Y_F$".

**BACK PITCH:-($Y_B$):-** The distance covered by the end connection of the conductors (coil sides). is known as back pitch & it is denoted by ("$Y_B$").

**RESULTANT PITCH:-($Y_R$):-** Defined as the distance between the start of one coil and the start of the next coil to which it is connected. It is also known as winding pitch or Resultant pitch ($Y_R$). It is denoted by '$Y_R$'

Commutator Pitch:-($Y_c$):- The distance measured in terms of commutator segments between the two ends of a coil are connected. Ex:- For Simplex winding - $Y_c = 1$
Duplex winding - $Y_c = 2$

FULL PITCH:- If the coil pitch is equal to the pole pitch then the winding is said to be "full pitch winding"

Short Pitch winding:/Short chorded winding:- If the coil pitch is not equal to the pole pitch. If it is short then the winding is called short chorded winding.

In such winding the copper required is less, hence copper loss is ~~less~~ will be less due to short end connections & harmonics become less.

SINGLE LAYER WINDING:- ~~Its~~ Is winding, in which only conductor / coil side is placed in each slot.

DOUBLE LAYER WINDING:- It is the winding, in which two conductor / coil sides are placed in each slot. Usually one of coil lies in the upper half ~~of~~ one slot & another side lies in the lower half of some other slot.

## Lab Winding :- In lap winding the finishing end of the one coil is connected via the commutator segment to the starting end of the ~~adjeent~~ adjacent coil situated under the same pole. As the sides of the successive coils overlap each other, this type of winding is called as lap winding.

Conditions of Lap winding.

a) The back pitch ($Y_b$) & front pitch ($Y_f$) must be odd.

b) The average pitch should be equal to the pole-pitch.

$$\text{ie } Y_a = \frac{Y_b + Y_f}{2} = \frac{Z}{P}$$

where Z - No. of conductors & P - No. of poles.

c) $Y_b = Y_f \pm 2Y_c$.

- When $Y_b$ is greater than $Y_f$ the winding is progressive.
- When $Y_b$ is less than $Y_f$ " " , retrogressive.

For a simplex lap winding, $Y_c = 1$.

$$\therefore Y_b = Y_f \pm 2 \quad \text{or} \quad Y_b - Y_f = \pm 2.$$

d) The resultant pitch is always even; being the difference of two odd no.

e) The no. of parallel paths in the armature winding for a simplex lap winding is equal to the no. of poles 'P'.

## Equilisers for Lap Winding :- In a lap winding no. of // le paths = No. of poles

The emf induced in each parallel path may not be exactly equal. This will cause internal circulating currents in the armature. This could cause excessive heating. To overcome this equilizer connections are provided

$$\text{No. of equilizer rings} = \frac{\text{No. of coil-sides / pole}}{2}$$

No. of connections to one equilizer ring = No. of pair of poles.

Ex. 1 Design & draw a developed winding diagram for a 16 slots, double layer 4-pole, DC progressive, simplex lap winding. Make provision for equilizer rings.

Soln :- No. of conductors or coil sides $= Z = 16 \times 2 = 32$, $P = 4$ No.

$$Y_a = \frac{Y_b + Y_f}{2} = \frac{Z}{P} = \frac{32}{4} = 8 \quad \therefore \frac{Y_b + Y_f}{2} = 8 \quad \text{ie } Y_b + Y_f = 16.$$

For a simplex progressive lap winding

$$Y_b - Y_f = 2 \quad \text{---} ①$$

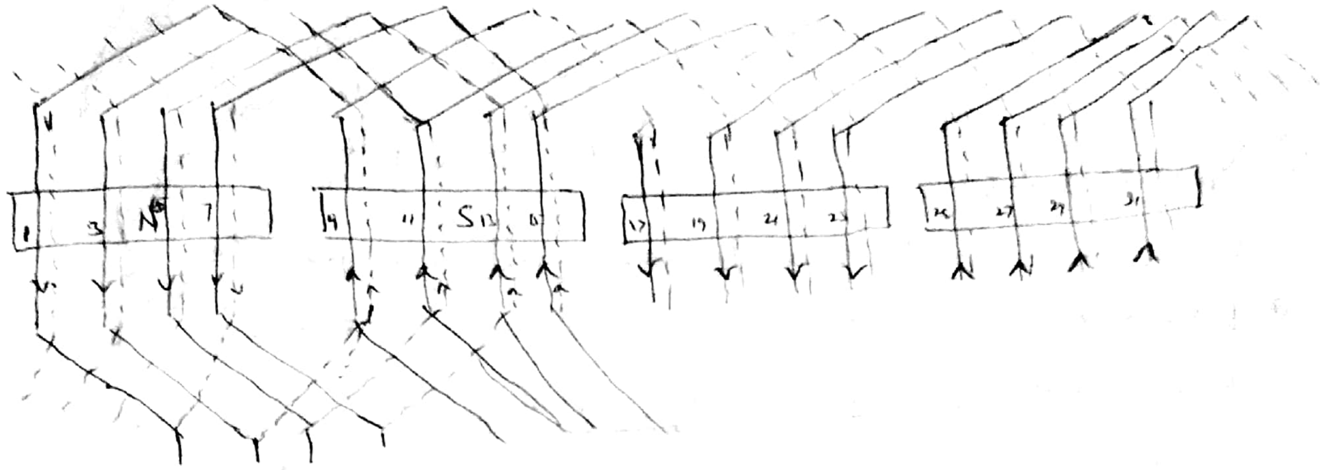
$$Y_b + Y_f = 16 \quad \text{---} ②$$

Adding these equations. $2Y_b = 18$ $\therefore Y_b = 9$ & $Y_f = 7$

No. of equiseliser rings $= \frac{\text{No. of coil-sides/pole}}{2}$

$$\frac{Z}{2P} = \frac{32}{2\times4} = 4$$

No. of connections each equiliser ring = No. of pair of poles $= 2$.




Winding Table

| Back pitch $Y_b = 9$ | Front pitch $Y_f = 7$ |
|---|---|
| 1+9 = 10 | 10−7 = 3 |
| 3+9 → 12 | 12−7 → 5 |
| 5+9 → 14 | 14−7 → 7 |
| 7+9 → 16 | 16−7 → 9 |
| 9+9 → 18 | 18−7 → 11 |
| 11+9 → 20 | 20−7 → 13 |
| 13+9 → 22 | 22−7 → 15 |
| 15+9 → 24 | 24−7 → 17 |
| 17+9 → 26 | 26−7 → 19 |
| 19+9 → 28 | 28−7 → 21 |
| 21+9 → 30 | 30−7 → 23 |
| 23+9 → 32 | 32−7 → 25 |
| 25+9 → 34(2) | 34−7 → 27 |
| 27+9 → 36(4) | 36−7 → 29 |
| 29+9 → 38(6) | 38−7 → 31 |

Coil side

connecting coil side

31+9 → 40(8)    40−7 → 33(1)

Ab No 28-4-14
Avadhut patil
Rakesh walake

Scanned by CamScanner

1) Draw & design a developed winding diagram for a 16 slots double layer. 4 Pole. DC progressive, simplex lap winding.

Soln :→

There is a double layer winding hence.

No. of conductors = $Z$ = slots × 2 = 16 × 2

$\therefore \boxed{Z = 32}$ conductors.

* Here, $P = 4$

$\therefore Y_a = \dfrac{Y_b + Y_F}{2} = \dfrac{Z}{P} = \dfrac{32}{4} = 8$

$\therefore Y_b + Y_F = 8 \times 2 \Rightarrow \boxed{Y_b + Y_F = 16}$

* For simplex Progressive lap winding ⇒

$Y_b - \cancel{Y_F} = 2$ — ①

$Y_b + \cancel{Y_F} = 16$ — ②

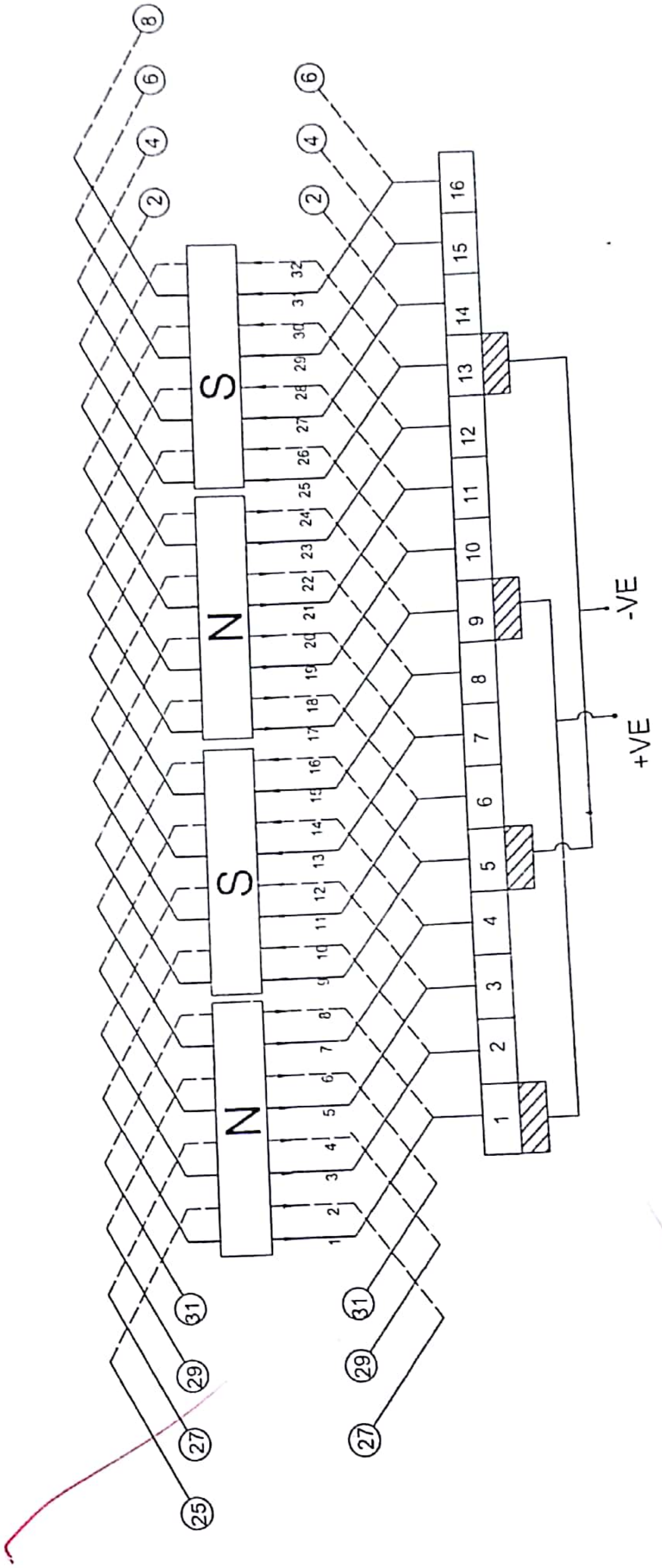
$2 Y_b = 18$

$\therefore \boxed{Y_b = 9}$

& $9 + Y_F = 16 \Rightarrow Y_F = 16 - 9 \Rightarrow \boxed{Y_F = 7}$

* Winding Table ⇒

| At the back $Y_b = 9$ coil connected side → coil side | At the front $Y_F = 7$ coil connected side → coil side | At the back $Y_b = 9$ coil connected side → coil side | At the front $Y_F = 7$ coil connected side → coil side |
|---|---|---|---|
| 1+9 = 10 | 10−7 = 3 | 15+9 = 24 | 24−7 = 17 |
| 3+9 = 12 | 12−7 = 5 | 17+9 = 26 | 26−7 = 19 |
| 5+9 = 14 | 14−7 = 7 | 19+9 = 28 | 28−7 = 21 |
| 7+9 = 16 | 16−7 = 9 | 21+9 = 30 | 30−7 = 23 |
| 9+9 = 18 | 18−7 = 11 | 23+9 = 32 | 32−7 = 25 |
| 11+9 = 20 | 20−7 = 13 | 25+9 = 34 (2) | 34−7 = 27 |
| 13+9 = 22 | 22−7 = 15 | 27+9 = 36 (4) | 36−7 = 29 |
| | | 29+9 = 38 (6) | 38−7 = 31 |
| | | 31+9 = 40 (8) | 40−7 = 33 (1) |


N
S
N
S
+VE
-VE

2) Draw a armature winding of a DC machine with 4 pole, 14 slots, double layer progressive lap winding shows the position of brush & direction of induced EMF.

⇒ No. of conductors $= Z = 14 \times 2 = 28$ & $P = 4$

* $Y_a = \dfrac{Y_b + Y_F}{2} = \dfrac{Z}{P} = \dfrac{28}{4} = 7$ //

$\therefore \quad Y_b + Y_F = 7 \times 2 = 14$

* For simplex progressive lap winding

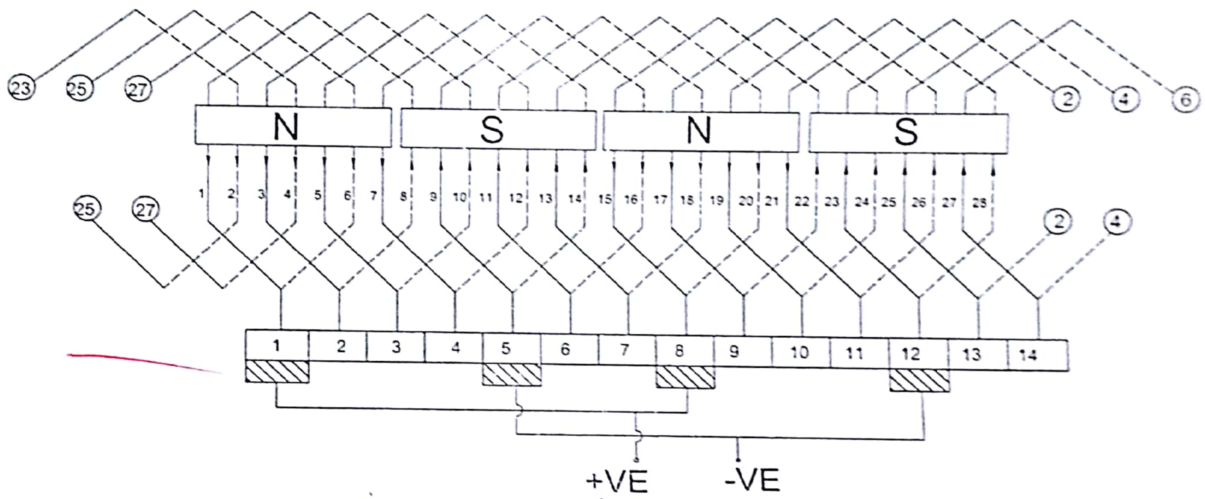
$$Y_b - Y_F = 2 \quad \text{--- (1)}$$
$$Y_b + Y_F = 14 \quad \text{--- (2)}$$
$$2Y_b = 16 \Rightarrow Y_b = 16/2$$
$$\therefore \boxed{Y_b = 8}$$

* $Y_F = Y_b - 2 \Rightarrow 8 - 2 \Rightarrow \boxed{Y_F = 6}$

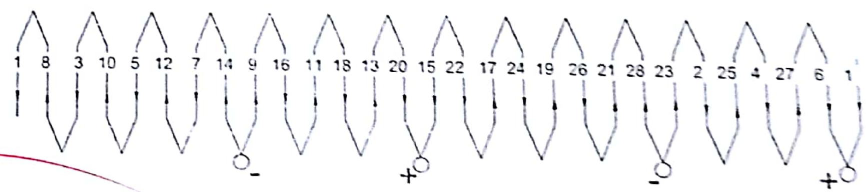
* Here, $Y_b$ & $Y_F$ are even so we can take odd numbers i.e. $\boxed{Y_b = 7}$ & $\boxed{Y_F = 5}$

* <u>winding Table</u> ⇒

| At the back $Y_b = 7$ Coil connected side → Coil side | At the front side $Y_F = 5$ Coil connected side → Coil side | At the back side $Y_b = 7$ Coil connected side → Coil side | At Front side $Y_F = 5$ Coil connected side → Coil side |
|---|---|---|---|
| $1+7 = 8$ | $8-5 = 3$ | $21+7 = 28$ | $28-5 = 23$ |
| $3+7 = 10$ | $10-5 = 5$ | $23+7 = 30$ (2) | $30-5 = 25$ |
| $5+7 = 12$ | $12-5 = 7$ | $25+7 = 32$ (4) | $32-5 = 27$ |
| $7+7 = 14$ | $14-5 = 9$ | $27+7 = 34$ (6) | $34-5 = 29$ (1) |
| $9+7 = 16$ | $16-5 = 11$ | | |
| $11+7 = 18$ | $18-5 = 13$ | | |
| $13+7 = 20$ | $20-5 = 15$ | | |
| $15+7 = 22$ | $22-5 = 17$ | | |
| $17+7 = 24$ | $24-5 = 19$ | | |
| $19+7 = 26$ | $26-5 = 21$ | | |




a) developed winding diagram




b) sequence diagram

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

3) Draw the developed winding diagram for 6 pole, 18 slots, double layer Full pitch lap wound DC generator. Draw the sequence diagram. Fix the position & polarity of brush. Mark the direction of armature.

⟹ There is a double layer winding hence,
No. of conductor = $Z = 18 \times 2 = 36$ // & $P = 6$.

$$\therefore Y_a = \frac{Y_b + Y_F}{2} = \frac{Z}{P} = \frac{36}{6} = 6 //$$

$$\therefore Y_b + Y_F = 6 \times 2 = 12 //$$

* For Simplex progressive lap winding ⟹

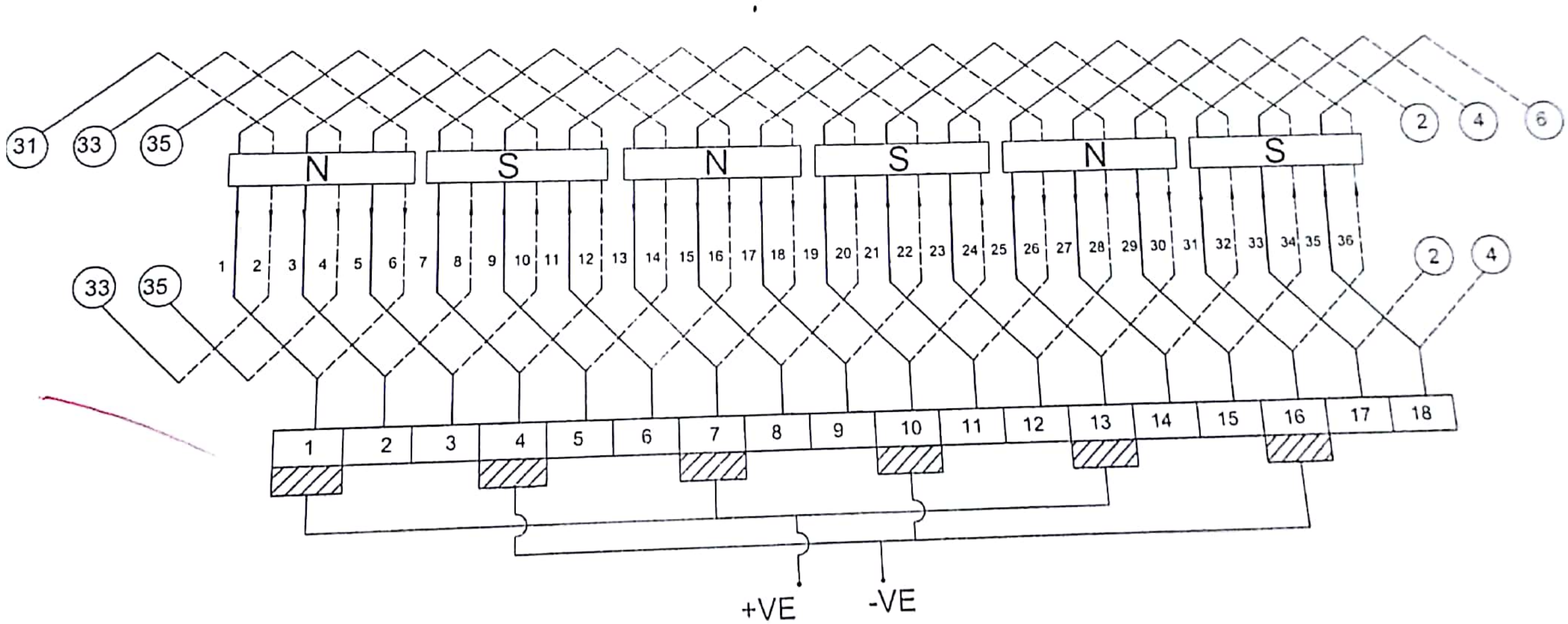
$$Y_b - \cancel{Y_F} = 2$$
$$Y_b + \cancel{Y_F} = 12$$
$$2Y_b = 14 \implies Y_b = 14/2$$

$$\therefore \boxed{Y_b = 7}$$

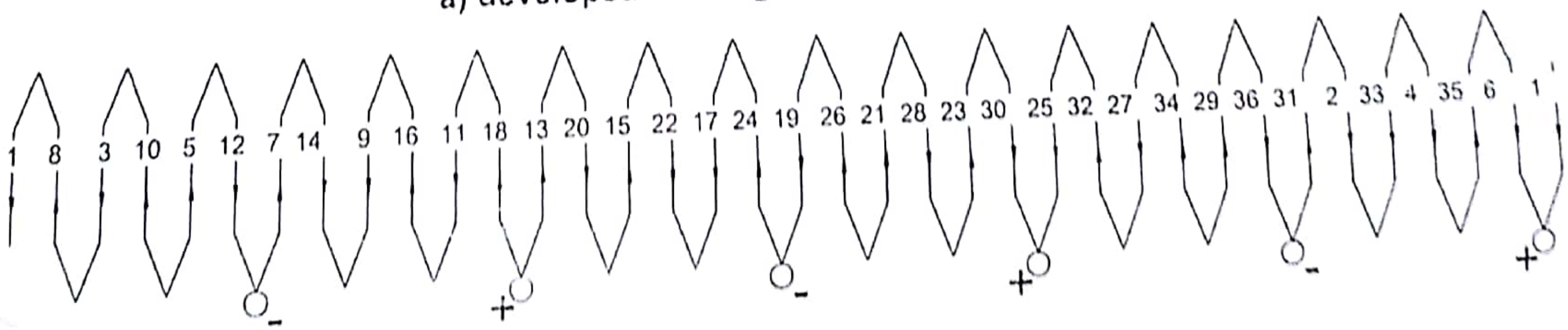
* $Y_F = Y_b - 2 \implies Y_F = 7 - 2 \implies \boxed{Y_F = 5}$

* Winding Table ⟹

| At back side $Y_b = 7$ Coil Side → Coil connected Side | At Front Side $Y_F = 5$ Coil Side → Coil connected Side | At back side $Y_b = 7$ Coil Side → Coil connected Side | At Front Side $Y_F = 5$ Coil Side → Coil connected Side |
|---|---|---|---|
| 1+7 = 8 | 8 − 5 = 3 | 21+7 = 28 | 28 − 5 = 23 |
| 3+7 = 10 | 10 − 5 = 5 | 23+7 = 30 | 30 − 5 = 25 |
| 5+7 = 12 | 12 − 5 = 7 | 25+7 = 32 | 32 − 5 = 27 |
| 7+7 = 14 | 14 − 5 = 9 | 27+7 = 34 | 34 − 5 = 29 |
| 9+7 = 16 | 16 − 5 = 11 | 29+7 = 36 | 36 − 5 = 31 |
| 11+7 = 18 | 18 − 5 = 13 | 31+7 = 38(2) | 38 − 5 = 33 |
| 13+7 = 20 | 20 − 5 = 15 | 33+7 = 40(4) | 40 − 5 = 35 |
| 15+7 = 22 | 22 − 5 = 17 | 35+7 = 42(6) | 42 − 5 = 37(1) |
| 17+7 = 24 | 24 − 5 = 19 | | |
| 19+7 = 26 | 26 − 5 = 21 | | |




a) developed winding diagram




b) sequence diagram

5) Design & draw a duplex winding diagram of a dc machine with 32 conductors & 4 poles. Shows the direction of rotation of the motor.

⟹ In duplex windings, there are 2 simplex windings starts from 1 & 3 conductors.

* Here, $P = 4$ & $Z = 22$

$$\therefore Y_a = \frac{Y_b + Y_F}{2} = \frac{Z}{P} = \frac{32}{4} = 8$$

$$\therefore Y_b + Y_F = 8 \times 2 = 16 \quad — ①$$

$$\& \quad Y_b - Y_F = 2m = 2 \times 2$$

$$\therefore Y_b - Y_F = 4 \quad — ②$$

$\because m = 2$ For duplex

* Hence,

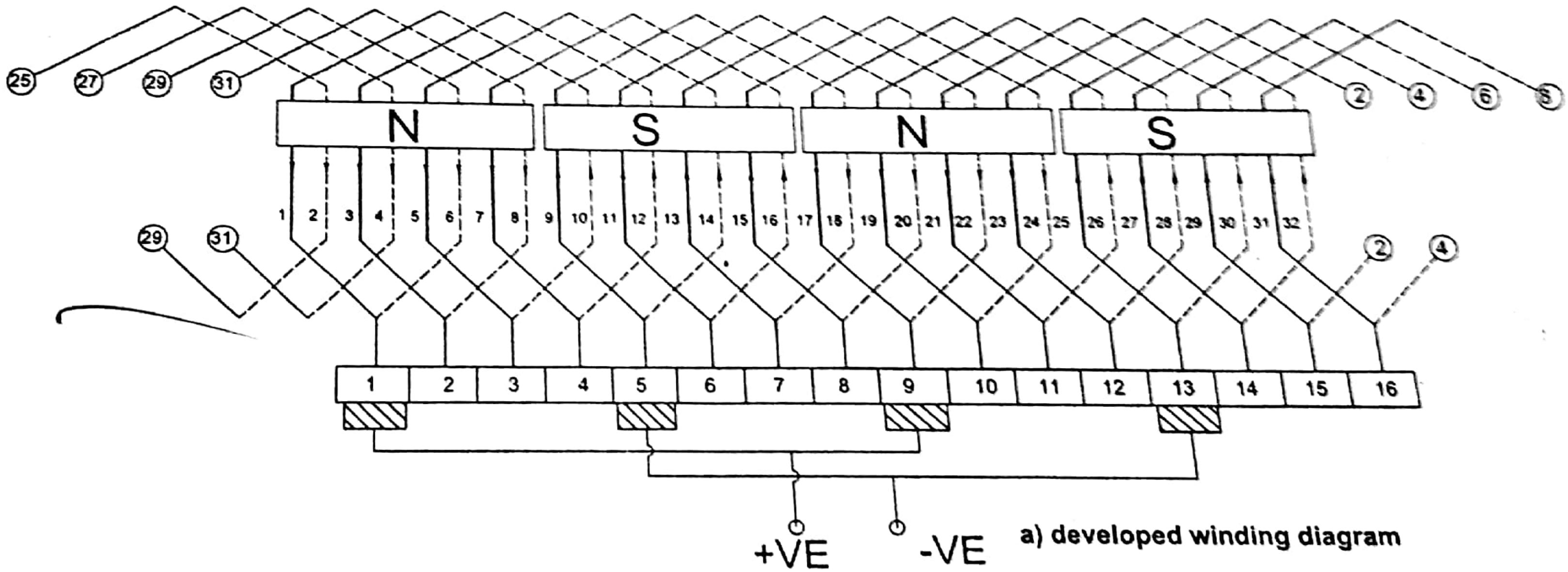
$$Y_b - \cancel{Y_F} = 4$$
$$Y_b + \cancel{Y_F} = 16$$
$$2Y_b = 20 \Rightarrow Y_b = 20/2 \Rightarrow \boxed{Y_b = 10}$$

* $Y_F = Y_b - 10 = 16 - 10 \Rightarrow \boxed{Y_F = 6}$

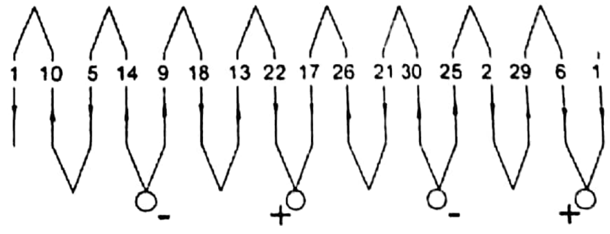
* we can takes the odd no. of $Y_b$ & $Y_F$. hence $\boxed{Y_b = 9}$ & $\boxed{Y_F = 5}$

* Winding Table ⟹

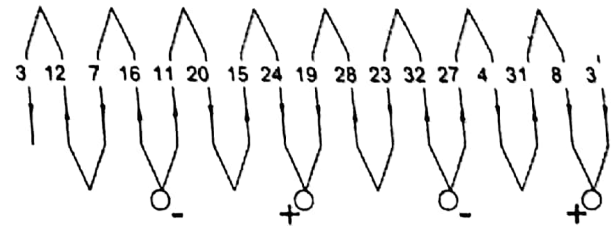
| 1st winding | | 2nd winding | |
|---|---|---|---|
| At back $Y_b = 9$ | At front $Y_F = 5$ | At back $Y_b = 9$ | At front $Y_F = 5$ |
| Coil Side → Coil Connected Side | Coil Side → Coil Connected Side | Coil Side → Coil Connected Side | Coil Side → Coil Connected Side |
| 1+9 = 10 | 10 − 5 = 5 | 3+9 = 12 | 12 − 5 = 7 |
| 5+9 = 14 | 14 − 5 = 9 | 7+9 = 16 | 16 − 5 = 11 |
| 9+9 = 18 | 18 − 5 = 13 | 11+9 = 20 | 20 − 5 = 15 |
| 13+9 = 22 | 22 − 5 = 17 | 15+9 = 24 | 24 − 5 = 19 |
| 17+9 = 26 | 26 − 5 = 21 | 19+9 = 28 | 28 − 5 = 23 |
| 21+9 = 30 | 30 − 5 = 25 | 23+9 = 32 | 32 − 5 = 27 |
| 25+9 = 34(2) | 34 − 5 = 29 | 27+9 = 36(4) | 36 − 5 = 31 |
| 29+9 = 38(6) | 38 − 5 = 33(1) | 31+9 = 40(8) | 40 − 5 = 35 |




a) developed winding diagram




b) sequence diagram 1st winding




c) sequence diagram 2nd winding

7) Design & draw 4 pole, double layer progressive wave winding with 17 slots double layer.

$\Rightarrow$

Here, double layer progressive wave winding.

$\therefore$ No. of conductor $= Z \times 2 = 17 \times 2 = 34$ & $P = 4$

$$Y_a = \frac{Y_b + Y_F}{2} = \frac{Z \pm 2}{P} = \frac{Z+2}{P} = \frac{34+2}{4} = 9$$

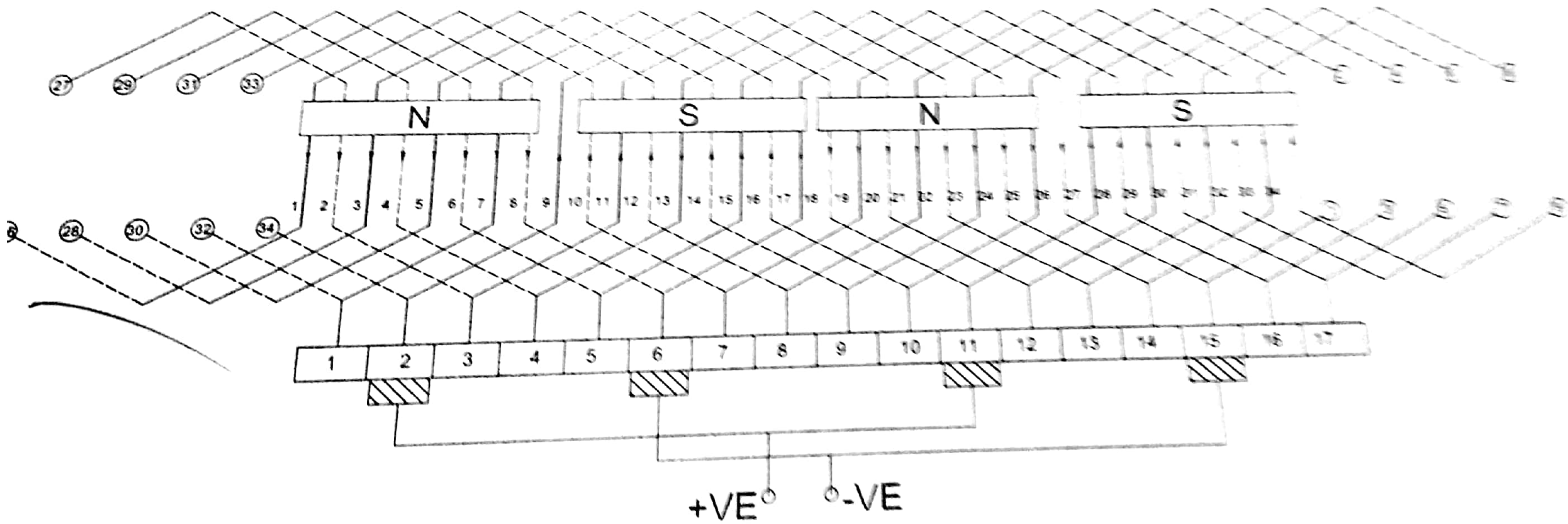
$$= \frac{Z-2}{P} = \frac{34-2}{4} = 8$$

* we can choose only odd values, hence,

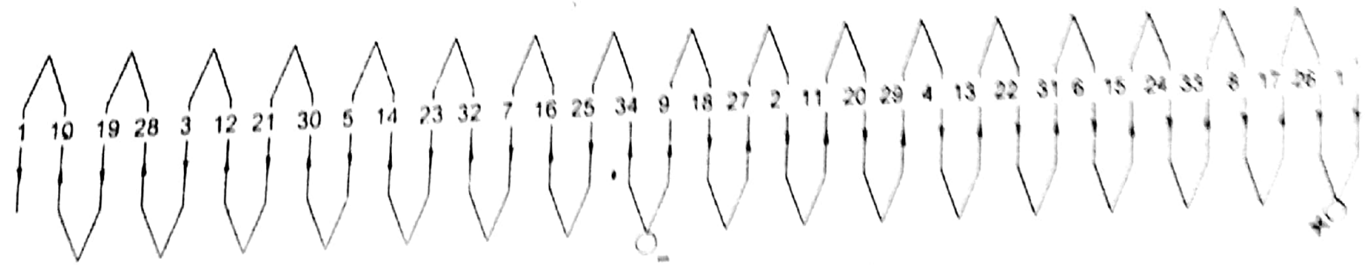
$Y_b = Y_F = 9$

* Winding Table $\Rightarrow$

| At the back $Y_b = 9$ coil side $\rightarrow$ coil connected side | At the front $Y_F = 9$ coil side $\rightarrow$ coil connected side |
|---|---|
| 1+9 = 10 | 10+9 = 19 |
| 19+9 = 28 | 28+9 = 37 (3) |
| 3+9 = 12 | 12+9 = 21 |
| 21+9 = 30 | 30+9 = 39 (5) |
| 5+9 = 14 | 14+9 = 23 |
| 23+9 = 32 | 32+9 = 41 (7) |
| 7+9 = 16 | 16+9 = 25 |
| 25+9 = 34 | 34+9 = 43 (9) |
| 9+9 = 18 | 18+9 = 27 |
| 27+9 = 36 (2) | 2+9 = 11 |
| 11+9 = 20 | 20+9 = 29 |
| 29+9 = 38 (4) | 4+9 = 13 |
| 13+9 = 22 | 22+9 = 31 |
| 31+9 = 40 (6) | 6+9 = 15 |
| 15+9 = 24 | 24+9 = 33 |
| 33+9 = 42 (8) | 8+9 = 17 |
| 17+9 = 26 | 26+9 = 35 (1) |




a) developed winding diagram




b) sequence diagram

**Example : 4**

Draw to suitable scale half sectional elevation and half sectional plan of a single phase 120 KVA, 2000/400 V shell type transformer from given sketch.

Missing details are to be suitably assumed.

Solution Fig. No. 5.26

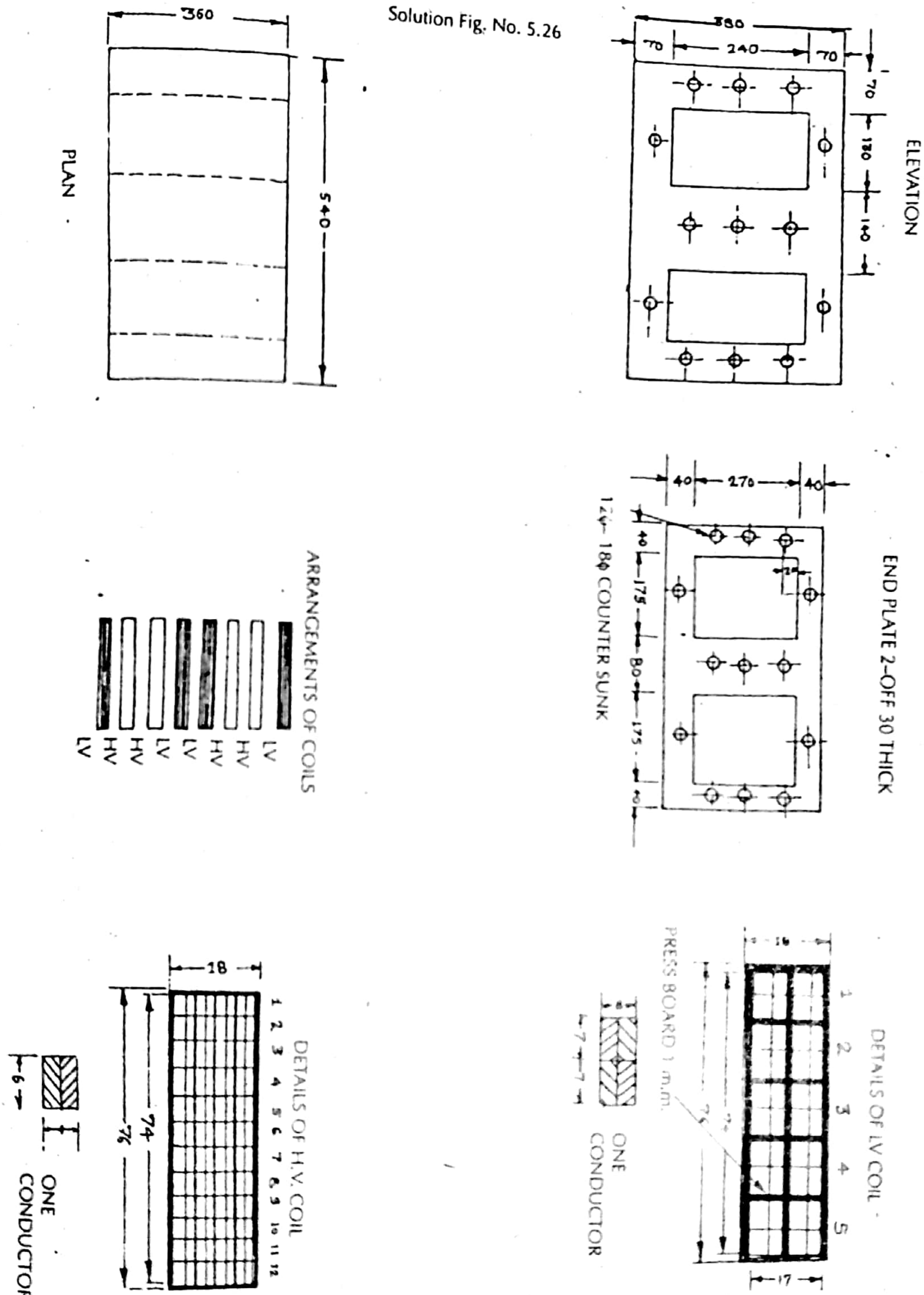
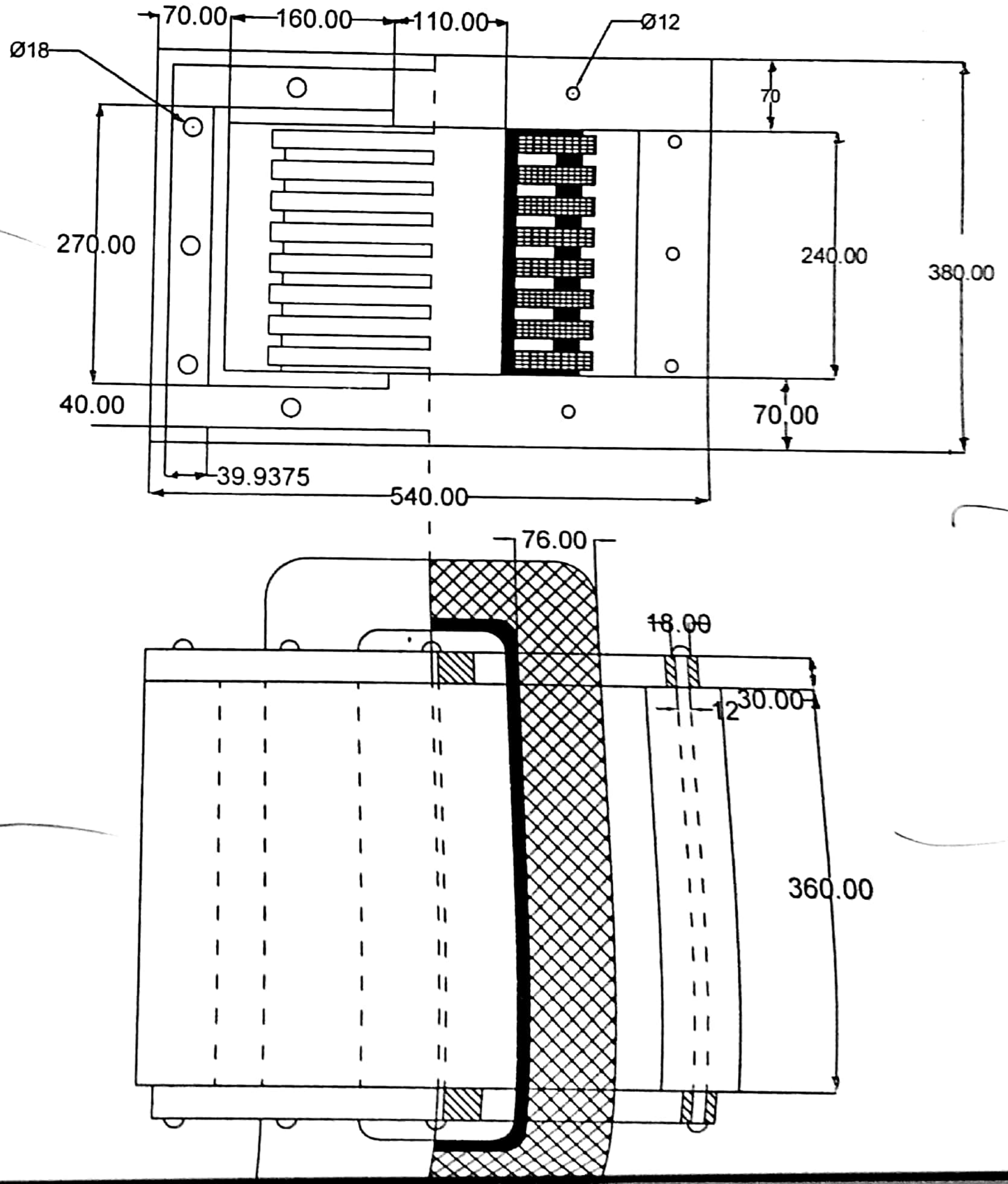



Fig. 5.25 : Given sketch

SHELL TYPE SINGLE PHASE TRANSFORMER

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

# 1 Phase Shell Type Transformer



The following are the details of three phase core type transformer draw to suitable scale.

1. Elevation of transformer assemble showing one limb in section.
2. plan of transformer assemble showing one limb in section

a) Core :- 3 step construction

Core dia = 220 mm

height of core = 1150 mm

height of yoke = 250 mm

Centre to centre distance between limb = 350 mm

b) LV winding :-

Inside dia LV winding 231 mm

winding in two layer total radial thickness = 13.3 mm

Radial thickness of one layer = 7.4 mm

Thickness of LV former = 3 mm

No. of turns per layer = 13 mm

Total height of LV winding = 1127 mm

c) H.V. winding :-

Outside dia of HT winding - 340 mm

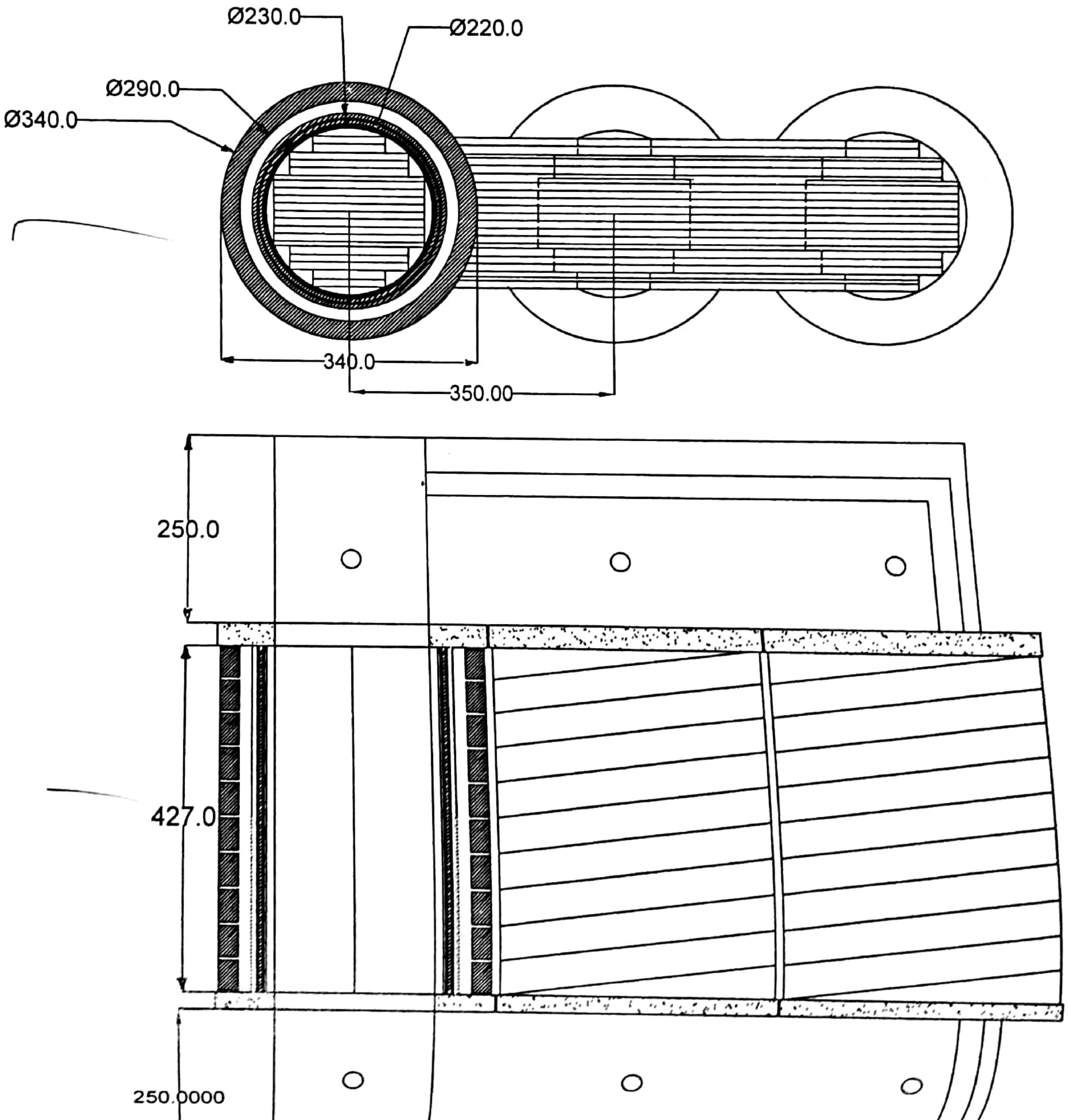
Total number of coils = 12

1. Two coils of end gem metal ring turns each of 14 mm thick
2. Ten coils of 56 turns each (made from upiece each 3 mm thick)

Total height of HT winding = 1127 mm

Average end clearance 33 mm from top and 20 mm from the bottom of the yoke.

# 3 PHASE CORE TYPE TRANSFORMER



Draw the front elevation left half in section, sectional plan and end view of a transformer with the dimensions given below. Scale 1/2 full size. Single phase core type 15 kVA with distribution on type transformer.

Details of Magnetic Circuit :-

Cross section of core = 63 mm x 91.6 mm

window = 298.5 mm x 114.5 mm

Yoke height = 63.5 mm

Details of Electrical Circuit :-

1. LV windings : No. of coils on each leg = 1

No. of turns per coils = 72

No. of layers per coil = 3

section of conductor = 2.79 mm x 10.6 mm

2. HV winding : No. of coils on each leg = 1

No of turns per coils = 720

No. of layers per coils = 8

Cross section of wire = 2.59 mm dia

Details of Dielectrical media :-

Air space around the core = 1.66 mm

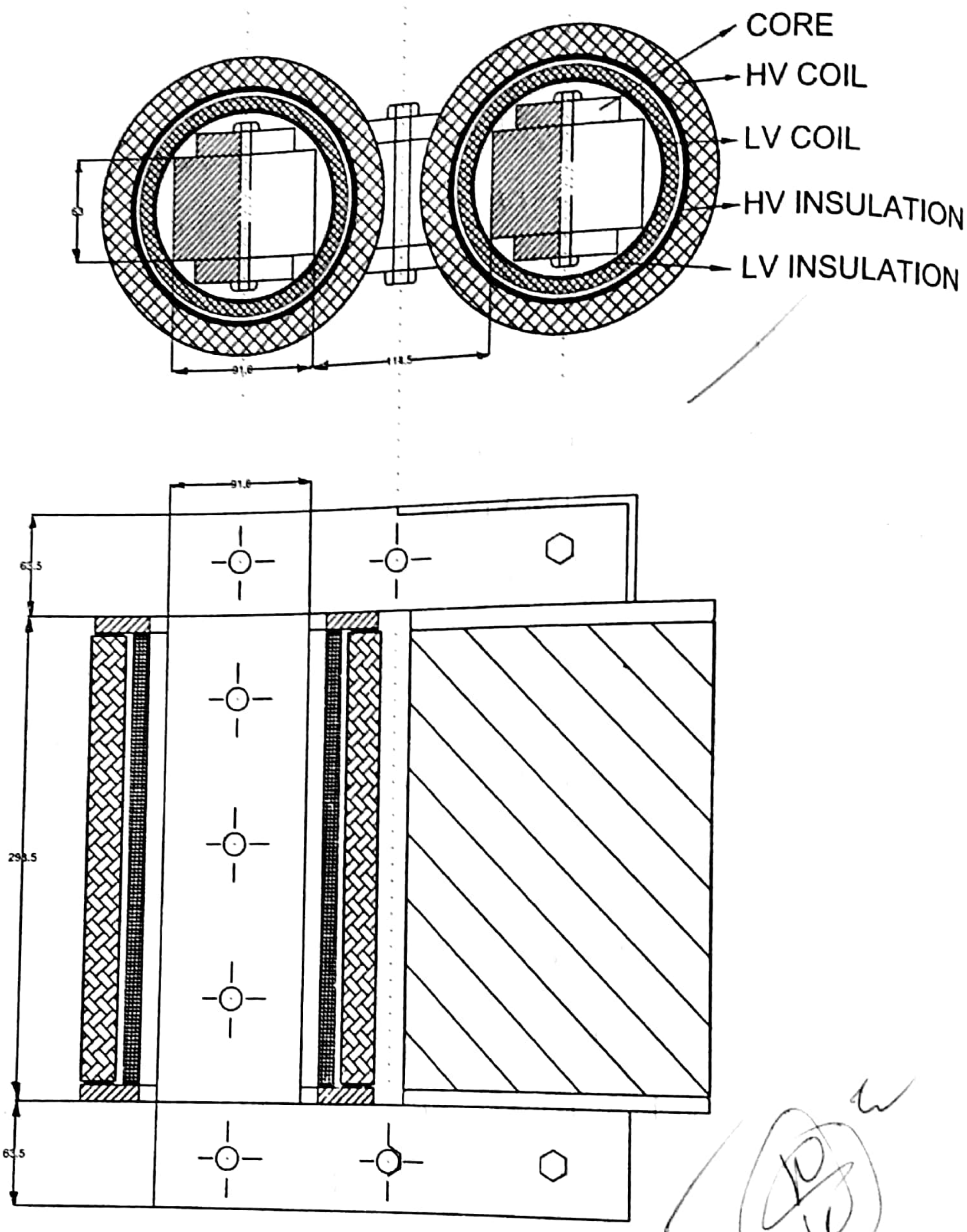
insulation b/w core and LT = 1.6 mm

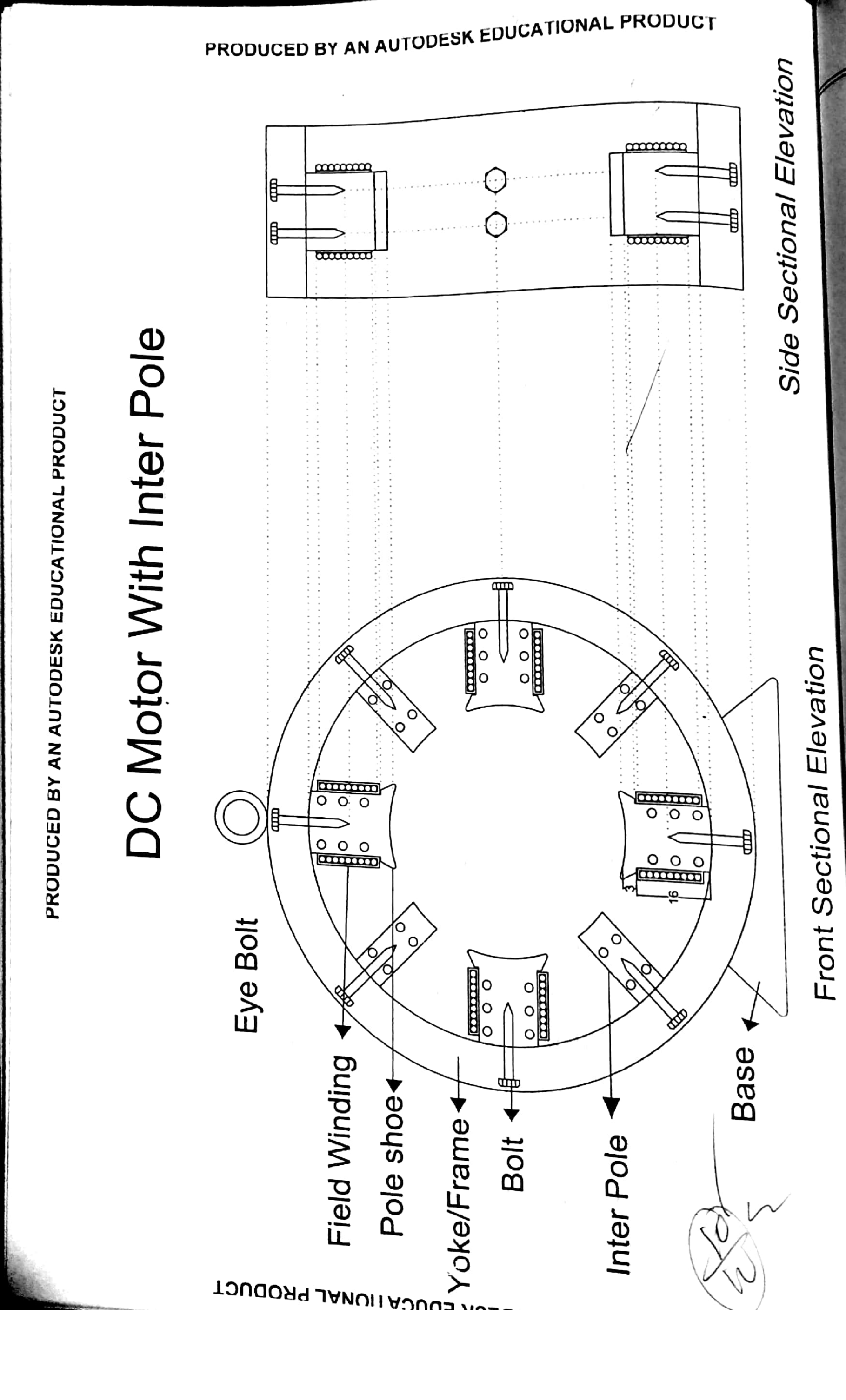
insulation on HT = 3 mm

insulation at the top and bottom winding and

insulation b/w layers = 0.35 mm.

All dimensions are in mm provide 10 mm. bolt with sleeve at suitable spacing.


CORE
HV COIL
LV COIL
HV INSULATION
LV INSULATION




Draw and design of DC motor with inter pole show the with suitable scale and also show

i) Front sectional elevation.

ii) Side sectional elevation.

**EXAMPLE : 6**

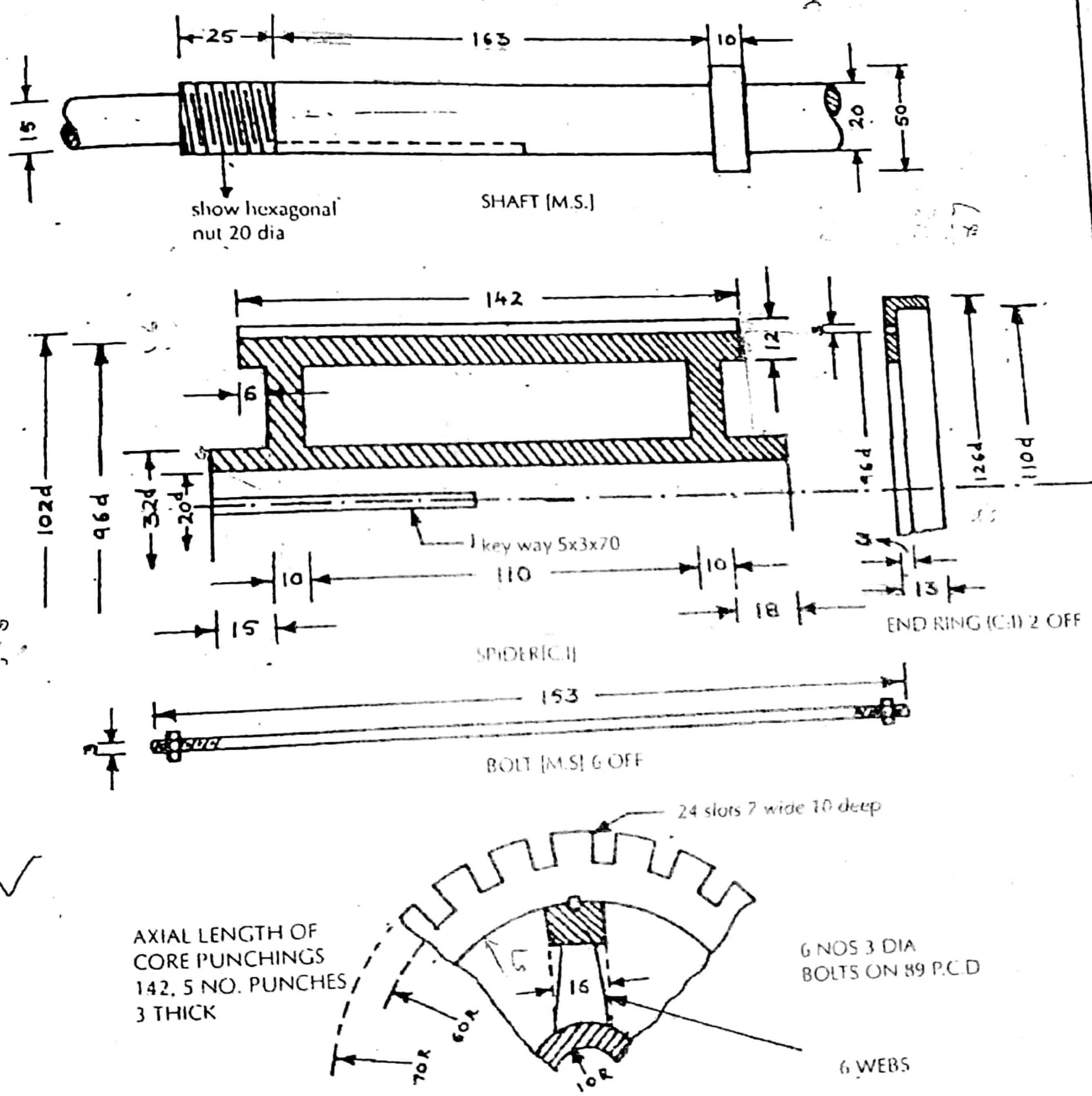
The accompanying sketch, gives the details of a D.C. machine armature. Draw the following assembled view of it, to full scale.

a) Half sectional front elevation, showing top half in section.

b) End elevation showing top half in section.

Solution Fig. 2.22.

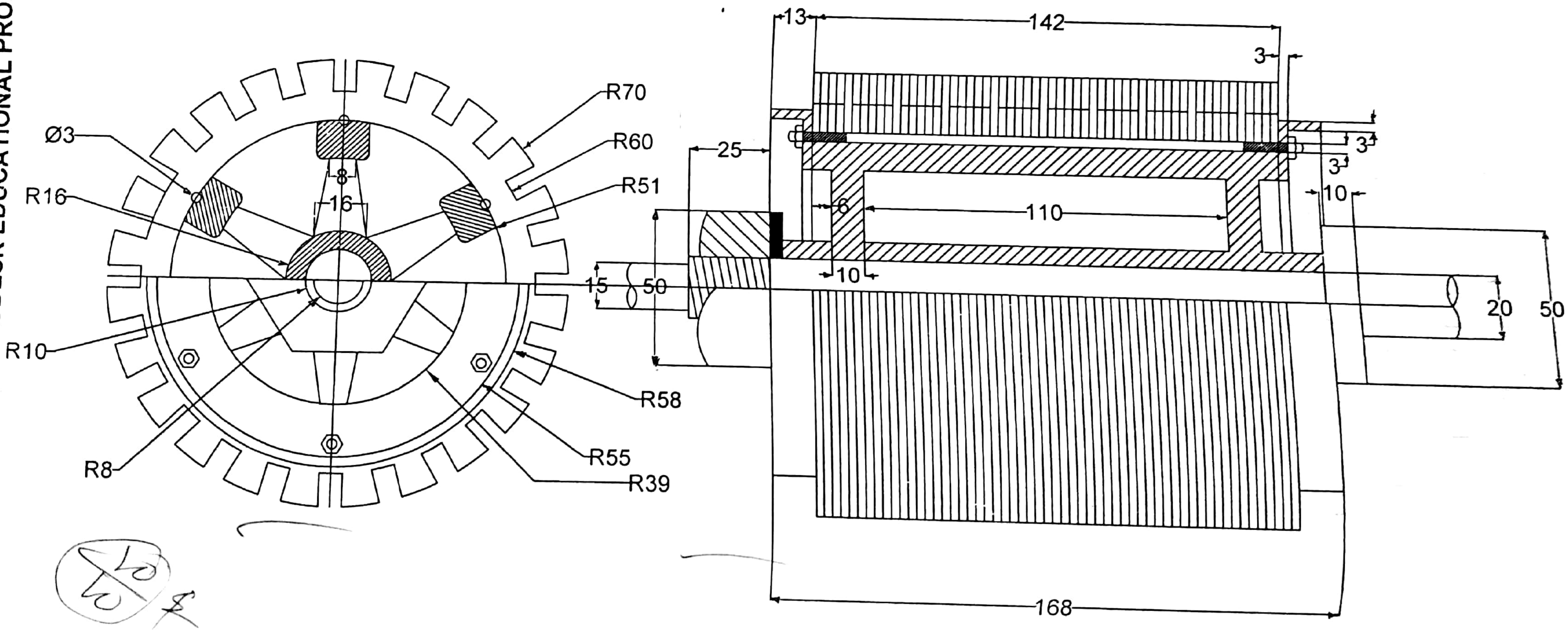
DETAILS OF PARTS OF ARMATURE OF A D.C. MACHINE




NOTE : ALL DIMENSIONS ARE IN MM

Fig. 2.21 accompaning sketch

# ARMATURE OF D.C. MACHINE



**EXAMPLE : 11**

The accompanying sketch shows the details of commutator parts. Draw the following view.

1. End elevation with top half in section 2. Front elevation with top half in section scale=Full scale.

Solution fig. 2.31

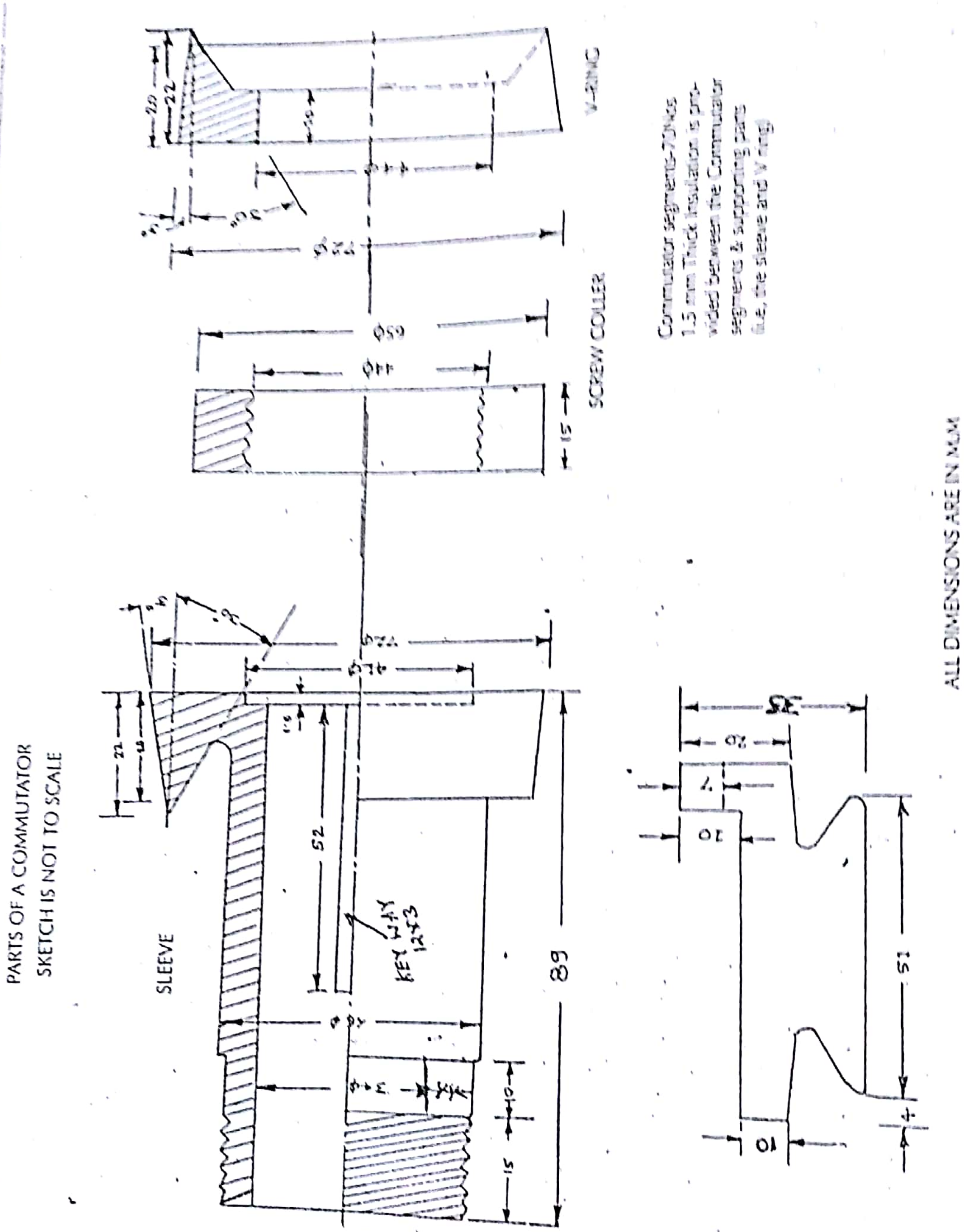
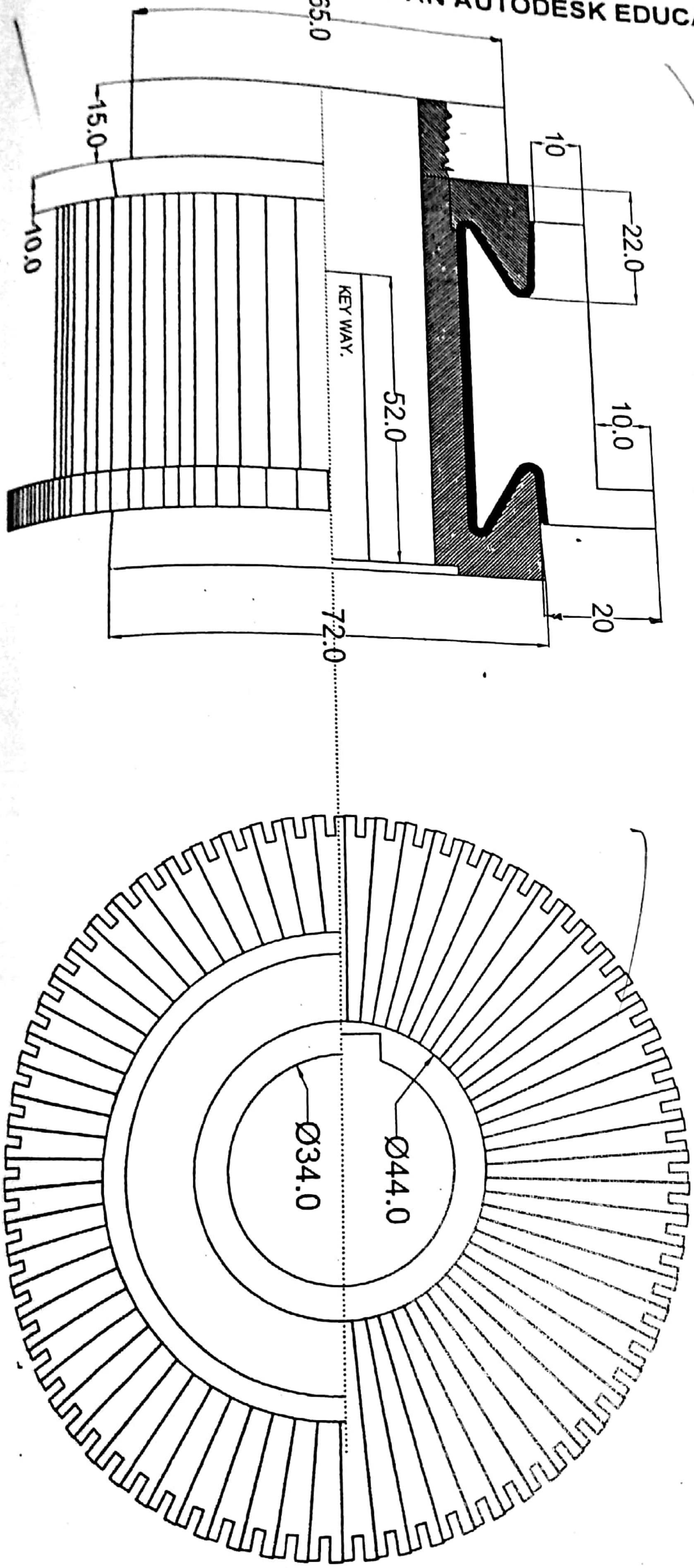


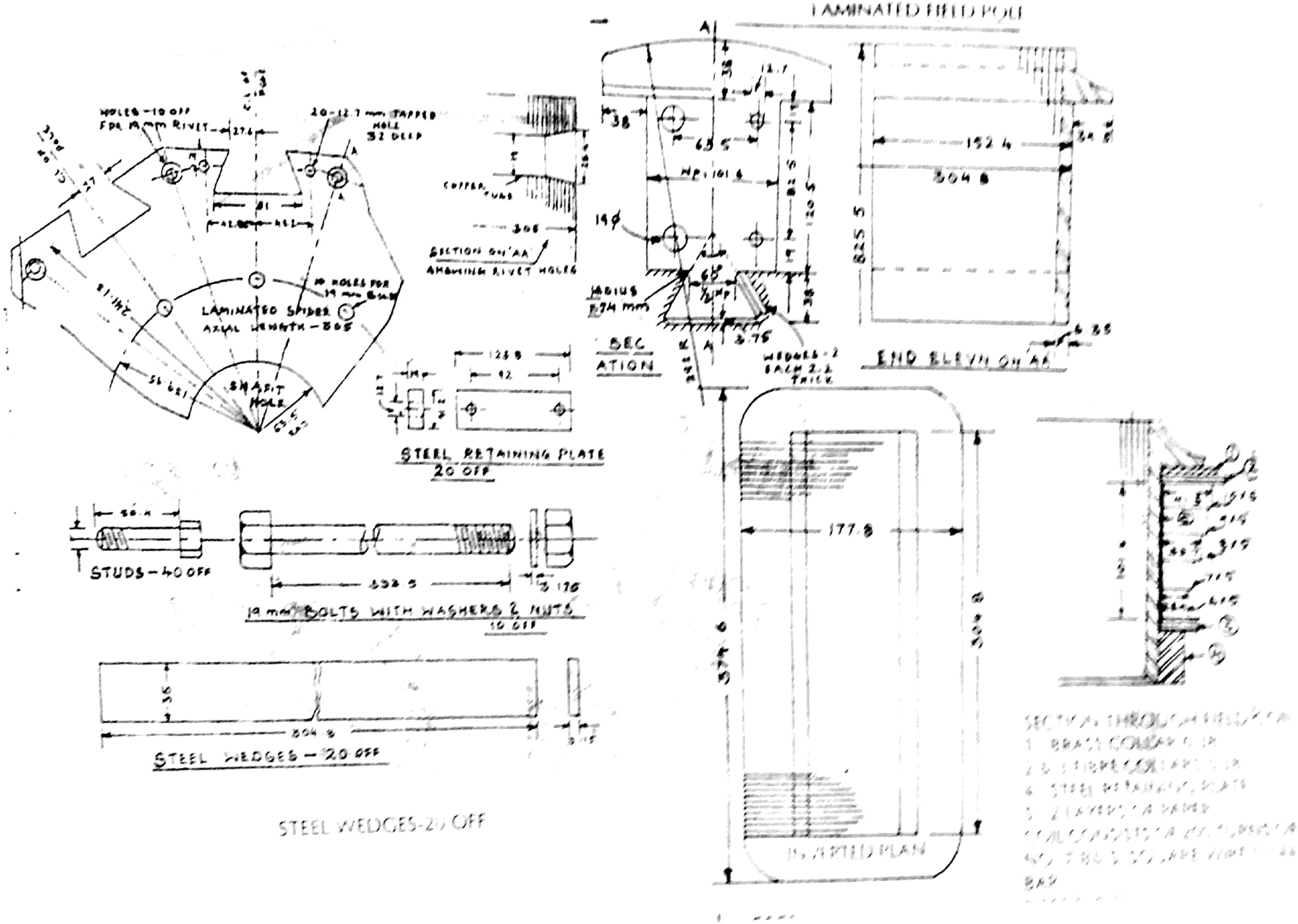

Fig. 2.30 accompanying sketch

PARTS OF A COMMUTATOR

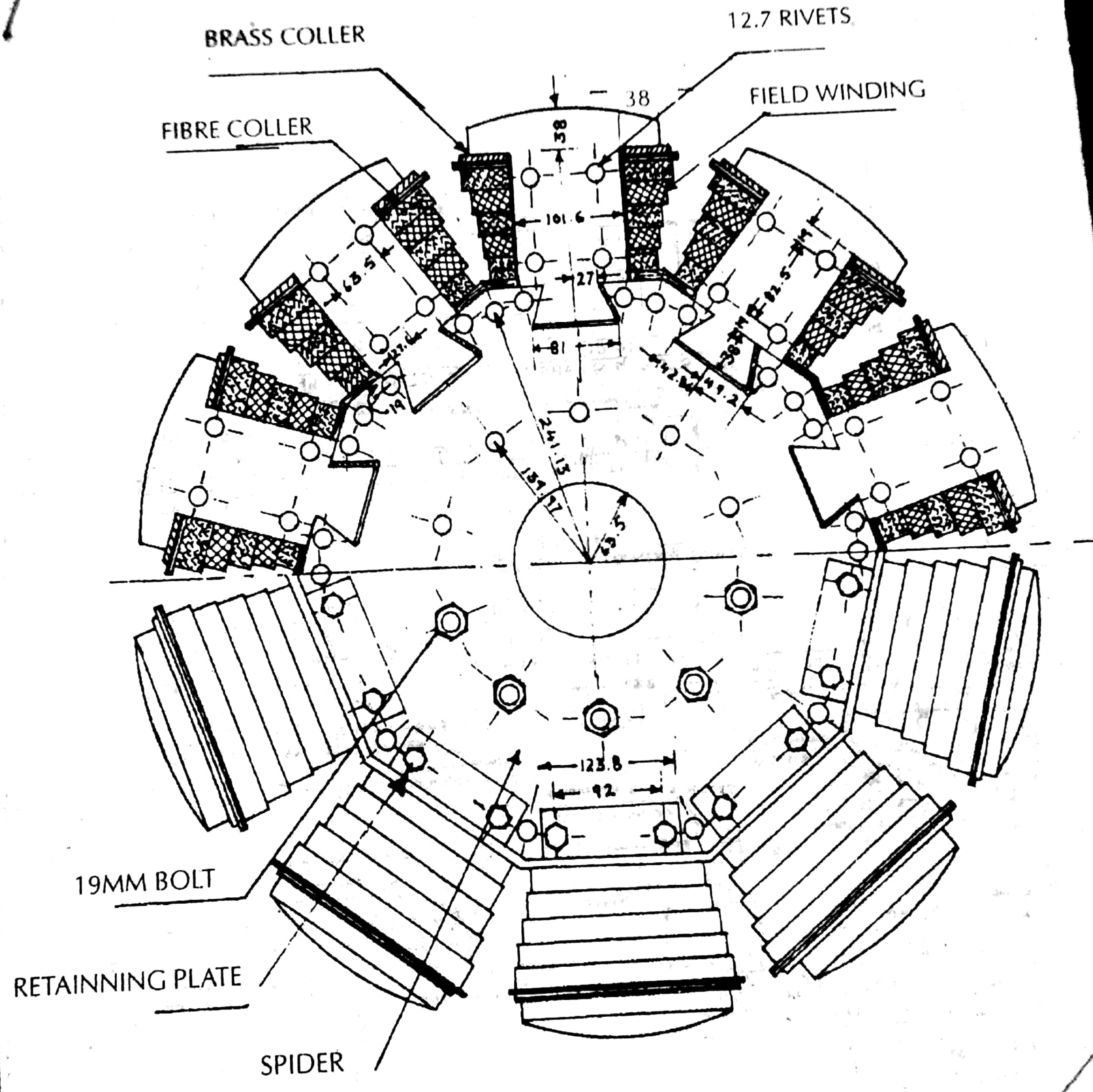



ICED BY AN AUTODESK EDUCATIONAL PRODUCT

Question.



STEEL WEDGES-20 OFF




END VIEW TOP HALF IN SECTION