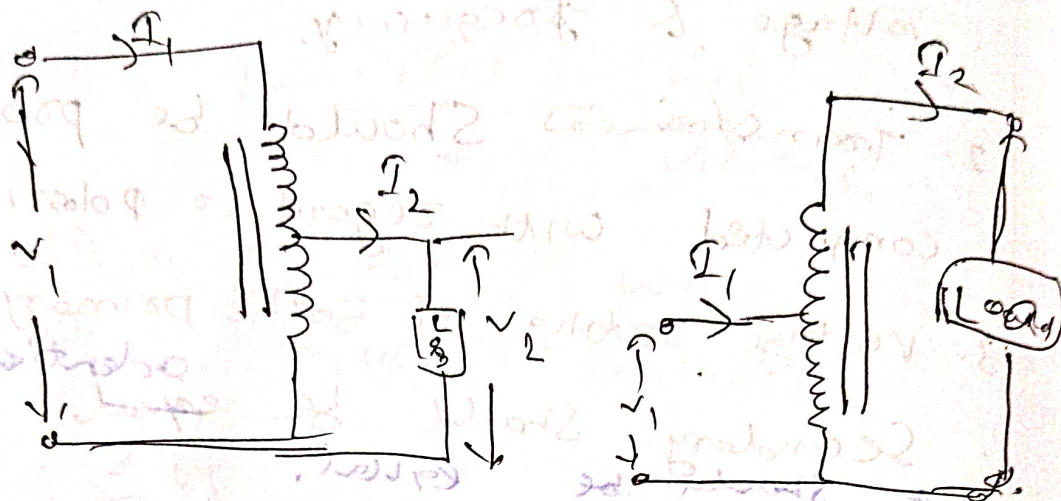


Auto-Transformer Ch-9

In this transformer one part is common to both primary and secondary. It uses less copper.



STEP down

Step up

AS compared to ordinary 2 winding Tlf of same output auto-transformers has higher efficiency, smaller size, better voltage regulation.

Wt. cu. in auto $(N_1 - N_2)I_1 + N_2(I_2 - I_1)$

in two winding Tlf $\propto N_1I_1 + N_2I_2$

$$\frac{\text{Wt. cu. in auto Tlf}}{\text{Wt. cu. in two winding Tlf}} = \frac{(N_1 - N_2)I_1 + N_2(I_2 - I_1)}{N_1I_1 + N_2I_2}$$

$$= \frac{N_1I_1 - N_2I_1 + N_2I_2 - N_2I_1}{N_1I_1 + N_2I_2}$$

$$= \frac{N_1I_1 + N_2I_2 - 2N_2I_1}{N_1I_1 + N_2I_2}$$

①

$$= 1 - \frac{2 \frac{Z_2}{Z_1}}{1 + \frac{Z_2}{Z_1} \times \frac{I_2}{I_1}}$$

$$= 1 - (K)$$

Wt. cu in Auto T/f = $(1-K) \times$ wt of cu in two winding T/f.

Savings W = K x (wt. cu. in ordinary T/f)

Power T/f inductively = $(1-K)$ input
conductively = $K \times$ input.

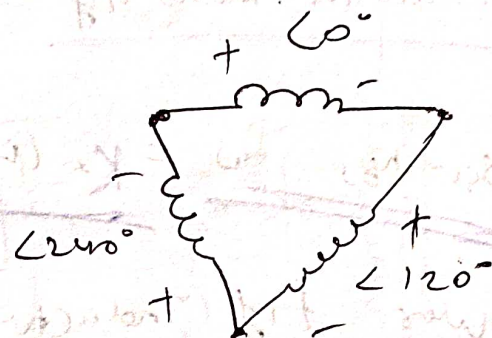
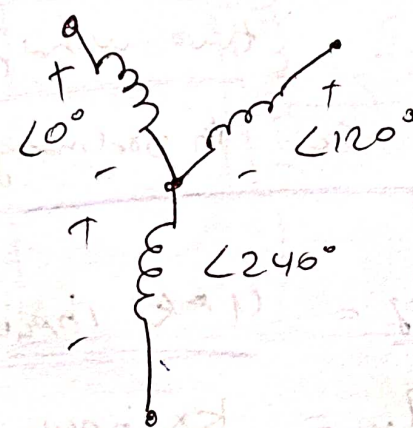
Uses

1. To give small boost to a distribution cable to correct the voltage drop.
2. Auto-t/f to give upto 50 to 60% of full voltage to an induction motor during starting.
3. In furnace T/f for getting a convenient supply to suit the furnace winding from a 230v supply.
4. As interconnecting T/f in 132kv/330kv system.
5. In control equipment for 1r phase and 3-phase electrical combinations.

3- ϕ Transformer

(1)

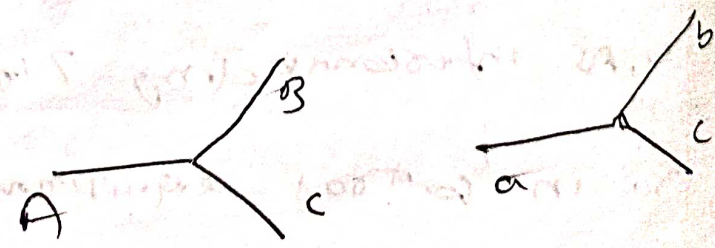
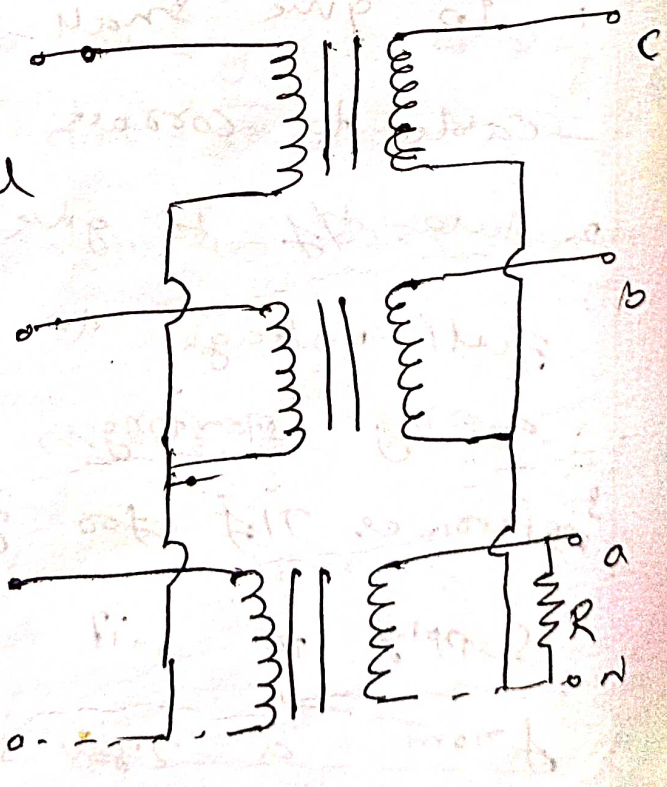
- Y - Y ✓
- Δ - Δ ✓
- Y - Δ ✓
- Δ - Y ✓



Y-Y

→ This connection is most economical for a high voltage small bsc insulation B required is less

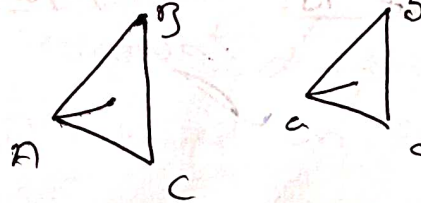
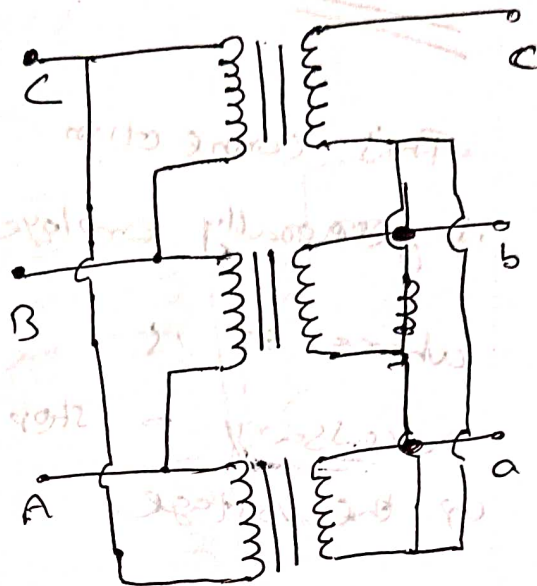
$$i.e. V_{ph} = \frac{1}{\sqrt{3}} V_L$$



Delta-Delta ($\Delta-\Delta$)

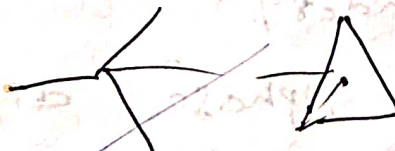
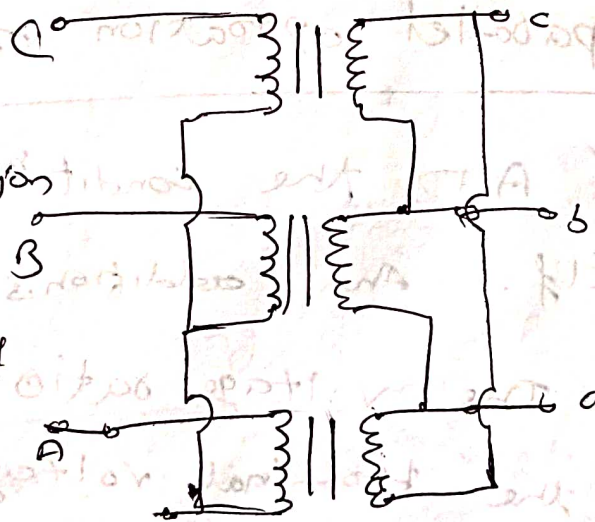
(2)

This connection is economical for large low-voltage transformers.



Y-D

The main use of this connection is at the substation end of the transmission line where the voltage is to be stepped down.

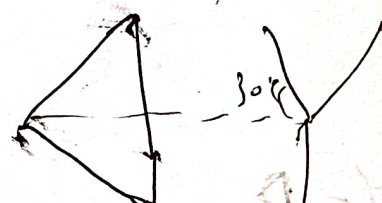
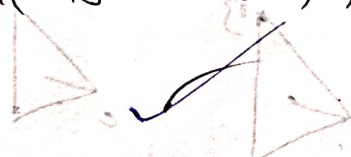
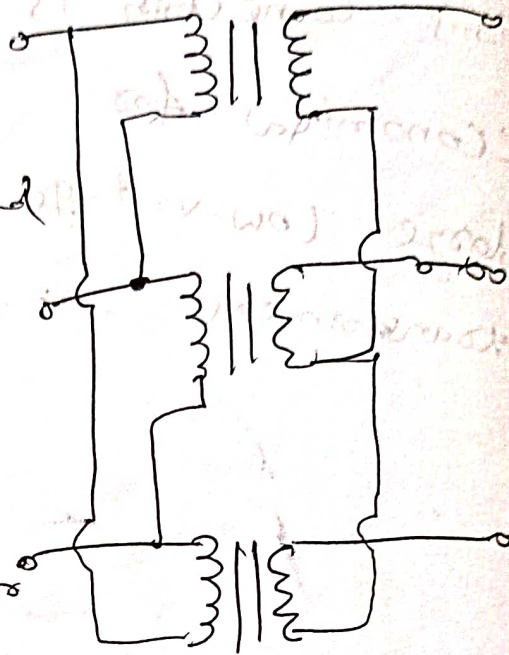


30' Ans...

D-7

(3)

This connection is generally employed where it is necessary to step up the voltage. It is most popular



parallel operation of 3- ϕ tlf

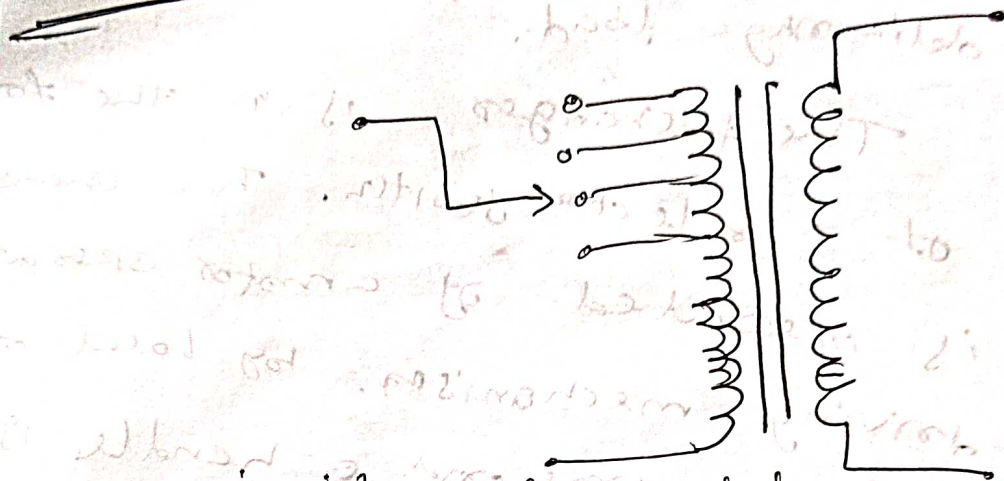
All the conditions of single phase tlf. And addition

1. The voltage ratio must refer to the terminal voltage of primary and secondary.

2. The phase displacement between primary and secondary voltages must be same for all tlf which are to be connected for parallel operation

3. phase sequence must be same.

TAP changing T/F



The principle of regulating the secondary voltage is based on changing the number of turns on the primary or secondary.

off-load tap changing
on load tap changing

off-load tap changing

This is the cheapest method.

Transformer is disconnected from the supply, the adjustment is made by tapping, then T/F is again connected.

It is done through switches
vertical tapping switches
face-plate switches

on-load tap changing

It is done when T/T is delivering load.

The tap-changer is in the form of a selector switch. The changer is operated by a motor operated driving mechanism, by local or remote control and a handle is also fitted for manual operation in case of an emergency.

- x -