SNS COLLEGE OF TECHNOLOGY
(Autonomous)
Coimbatore-35
Department of EEE

16EE205 / INDUCTION AND SYNCHRONOUS MACHINES

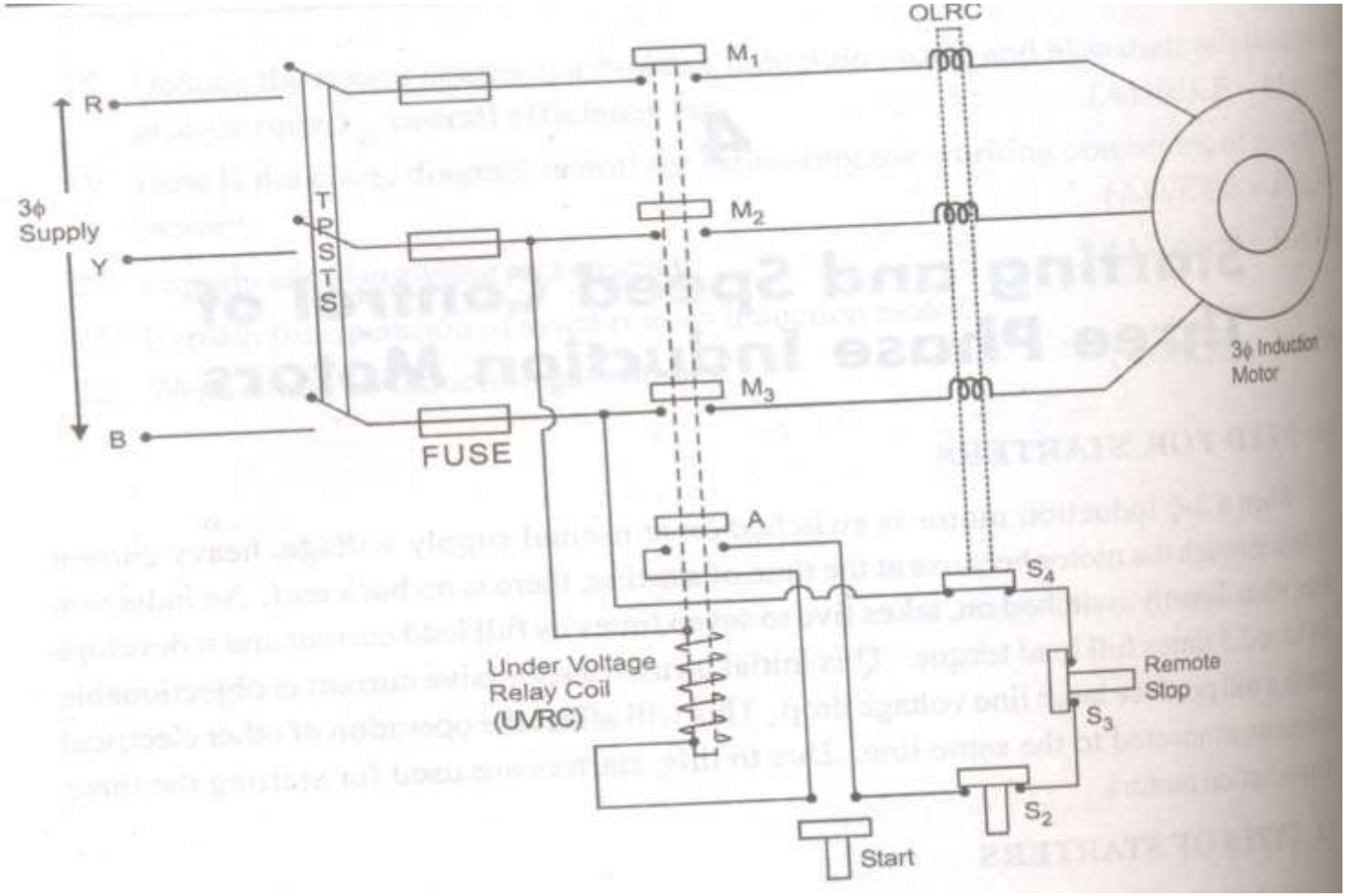
Unit – IV (A)
Starting of Three phase Induction motor

Need for Starting – Types of Starters

At starting when the rotor is at standstill, the squirrel cage rotor is just like a short circuited secondary.

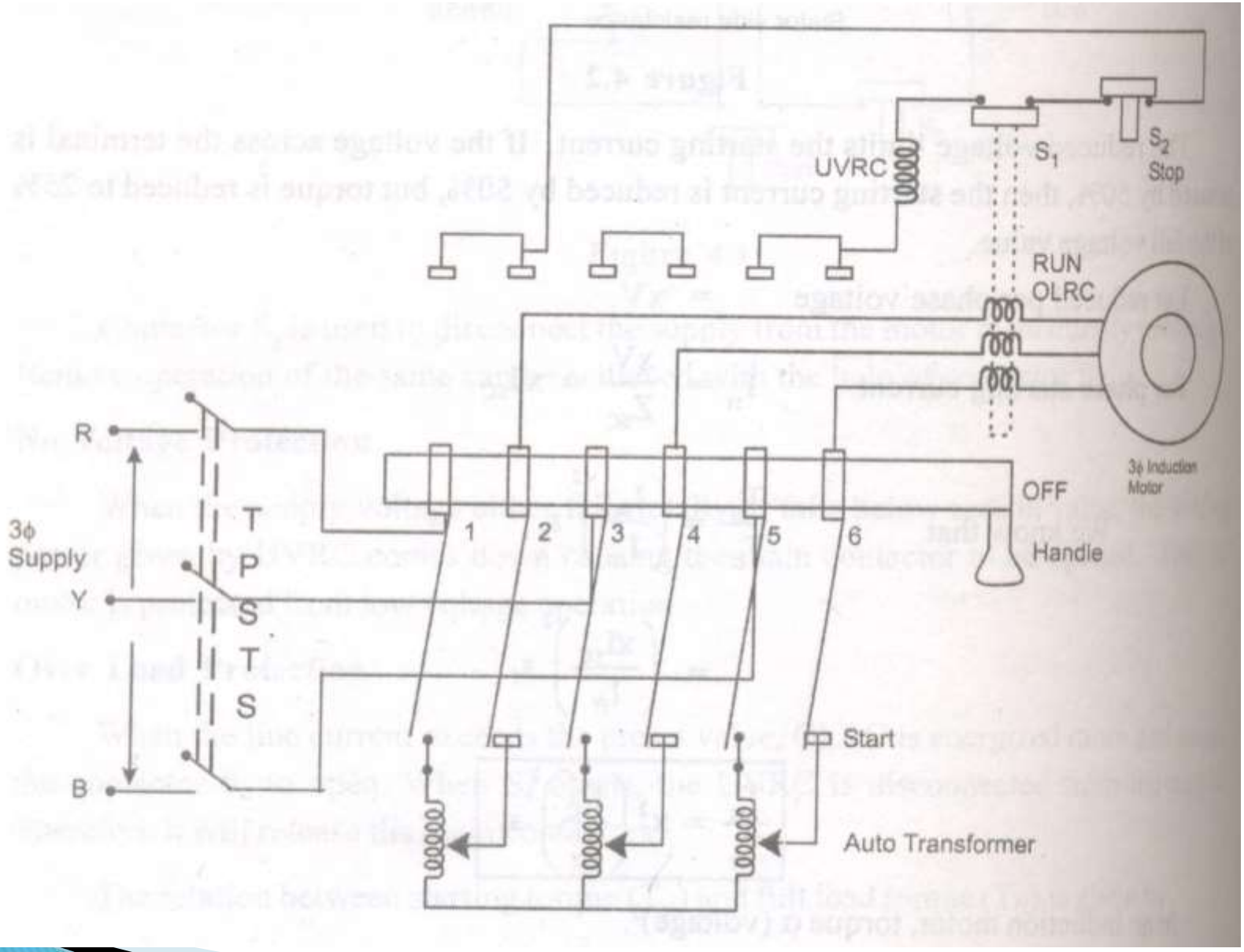
Therefore the current in the rotor circuit will be high and consequently the stator also will draw a high current from the supply lines if full line voltage were applied at start.

1.D.O.L Starter



2.Auto –Transformer Starter

- A three phase auto transformer can be used to reduce the voltage applied to the stator
- The advantage of this method is that the voltage is reduced by transformation and not by dropping the excess in resistor
- Hence the input current and power from the supply are also reduced compared to stator resistor starting.


UVRC
S_1
S_2
Stop
RUN
OLRC
3ϕ Induction Motor
OFF
Handle
R
3ϕ
Supply
Y
B
T
P
S
T
S
1
2
3
4
5
6
Start
Auto Transformer

Auto –Transformer Starter

The ratio of starting torque (Tst) to full load torque (Tf):

$$\frac{T_{st}}{T_f} = x^2 \left(\frac{I_{st}}{I_f} \right)^2 S_f$$

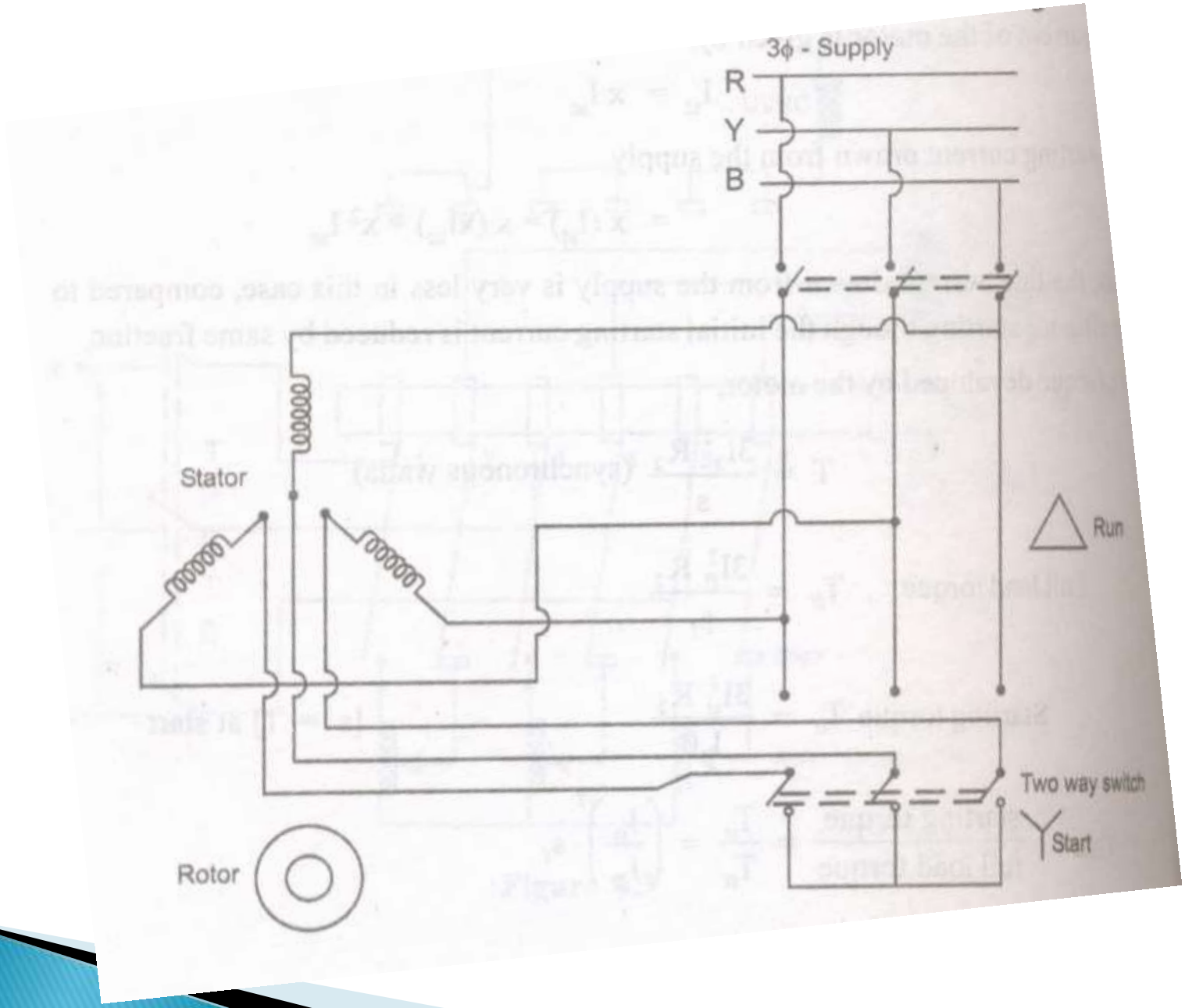
Ist = starting current and Ist = full load current

X = Transformer tapping as p.u. of rated voltage

S_f = Full load slip

3.Star-Delta Starter

- This method applicable for motors designed to run normally with delta connected stator windings
- At starting, the stator windings connected in star
- After the motor has reached nearly the steady state speed, the windings are connected in delta
- Over load and single phasing protection are provided.

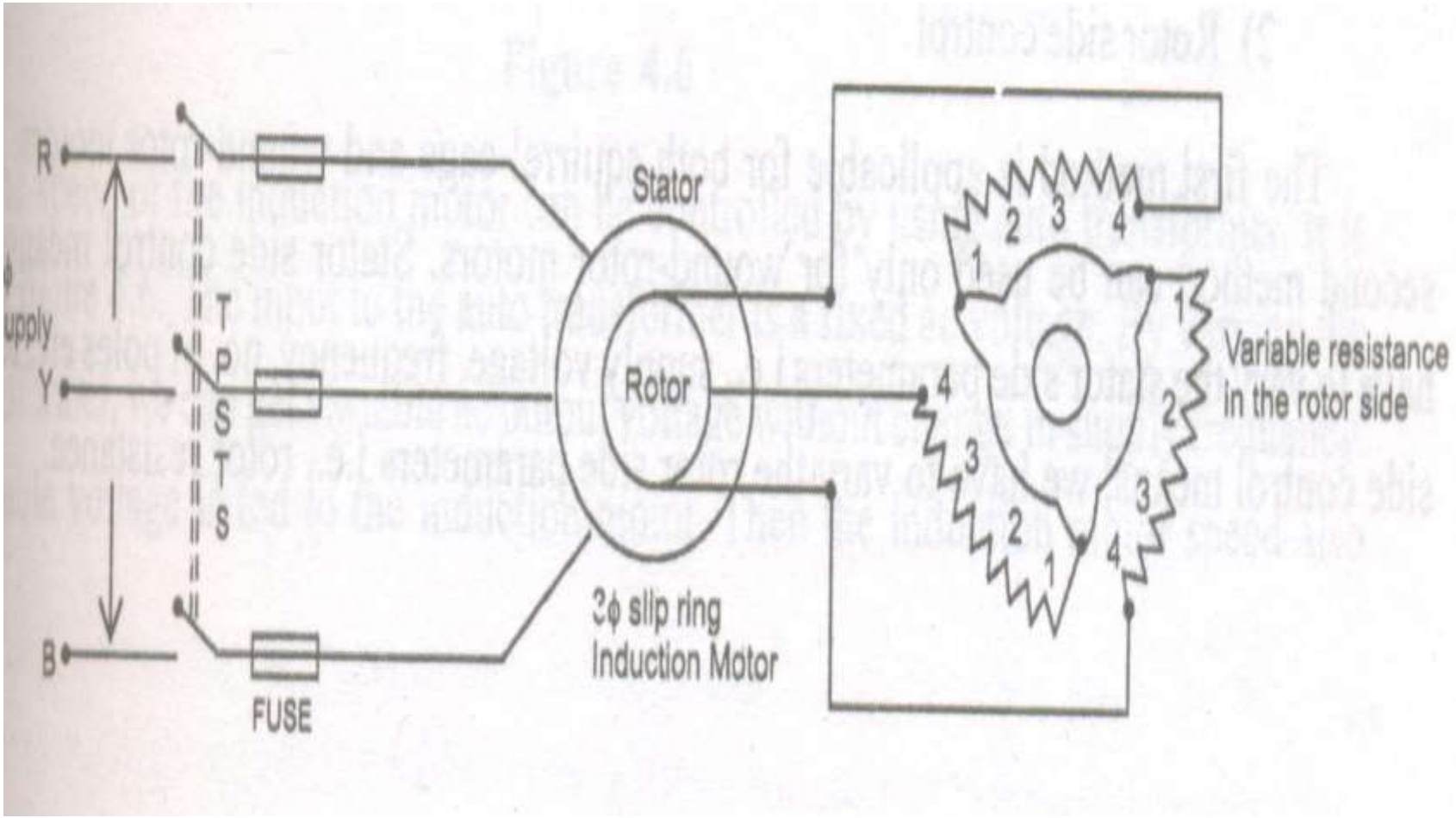

3ϕ - Supply
R
Y
B
Stator
Run
Two way switch
Start
Rotor

Star-Delta Starter

- At starting the stator phase voltage reduced by $1/\sqrt{3}$ times the voltage.
- Phase current reduced by $1/\sqrt{3}$ times the current with the direct online starting.
- Line current reduce by 3 times.

4.Rotor Resistance Starter

- Applicable to slip ring induction motors
- Rated voltage applied to the stator
- balanced three phase resistors connected in series with the rotor through slip rings
- Resistance kept at maximum at starting
- starting current reduced
- starting torque increased
- after starting resistance can be cut out


R
Y
B
upply
TPSTS
FUSE
Stator
Rotor
3ϕ slip ring
Induction Motor
1
2
3
4
Variable resistance
in the rotor side