

QUESTION BANK

EE6351- ELECTRICAL DRIVES AND CONTROLS

UNIT III - STARTING METHODS

1) ~~HW~~ What is the Necessity of starter?

Both d.c motors as well as three phase induction motors are self starting but these motors show the tendency to draw very high current at the time of starting. Such a current is very high and can cause damage to the motor windings. Hence there is a need of a certain device which can limit such a high starting current. Such a device which limits the high starting current is called a starter.

2) What is meant by starting resistance?

To restrict this high starting armature current, a variable resistance is connected in series with the armature at start. This resistance is called starter or a starting resistance.

3) ~~HW~~ What are the two types of starters used for D.C shunt motors?

- a) Two point starter b) three point starter c) Four Point starter

4) What are the main parts of three point starter?

L = line terminal to be connected to positive of supply

A = to be connected to the armature winding

F= to be connected to the field winding

5) ~~HW~~ What are the disadvantages of three point starter?

Here NVC and the field winding are in series. so while controlling the speed of the motor above rated, field current is reduced by adding an extra resistance in series with the field winding. To avoid the dependency of NVC and the field winding, four point starter is used in which NVC and the field winding are connected in parallel.

6) What are the main parts of four point starter?

L = line terminal to be connected to positive of supply

A = to be connected to the armature winding

F= to be connected to the field winding

N=Neutral

7) What is automatic starter?

Upon pressing ON-push button(start button),current limiting starting resistors get connected in series with armature circuit in DC motor.Then,some form of automatic control progressively disconnects these resistors until full-line voltage is available to the armature circuit. On pressing an OFF push button the system should get back to its original position.

8) Why starts are used for DC motors?

In DC motors starters are used to limit the starting current within about 2 to 3 times the rated current by adding resistance in series with the armature circuit. Other than this starting resistances starters are variable fitted with protective devices like no –voltage protection and over-load protection.

9).Why stator resistance rarely used?

Due to addition of resistance in the stator side cause the voltage available to the motor X times the normal voltage i.e. The starting current drawn by the motor as well as the current drawn from the supply get reduced by X times,where as the starting torque developed gets reduced by X² times.

10) What are the effects of increasing rotor resistance in the rotor circuit of a 3-phase induction motor as starting?

Due to addition of resistance in rotor circuit by the stator not only reduces the starting current, in addition to that the starting torque developed than those given by DOL starting.

11) What are the advantages of Electronic starter?

- The moving parts and contacts get completely eliminated.
- The arcing problem gets eliminated.
- Minimum maintain ance is required as there are no moving parts.
- The operation is reliable
- Starting time also gets reduced.

12) How are the various types of reducing starting current?

- Stator resistance starter

- Autotransformer starter
- Star-delta starter
- Rotor resistance starter
- Direct on line starter

13) ~~What~~ what is an autotransformer starter?

A three phase star connected autotransformer can be used to reduce the voltage applied to the stator. Such a starter is called as autotransformer starter.

14) ~~What~~ what is a star-delta starter?

This is the cheapest starter of all and hence used very commonly for the induction motors. It uses triple pole double throw (TPDT) switch. The switch connects the stator winding in star at start. Hence per phase voltage get reduced by the factor $1/\sqrt{3}$. Due to this reduced voltage, the starting current is limited.

15) What is the function of starters?

- For large capacity induction motors is to reduce the starting current
- Having necessary control devices to limit the starting current
- All starters are provided devices to protect the motor against overload and loss of supply voltage.

BIG QUESTIONS

1) ~~Draw~~ Draw and explain a three point starter for a dc motor?

2) What are the different types of AC motor starter?

3) ~~Explain~~ Explain the different types of starters used in cage induction motor with a neat sketch?

4) Why starter is necessary for the induction motor?

5) ~~Draw~~ Draw and explain rotor resistance starter

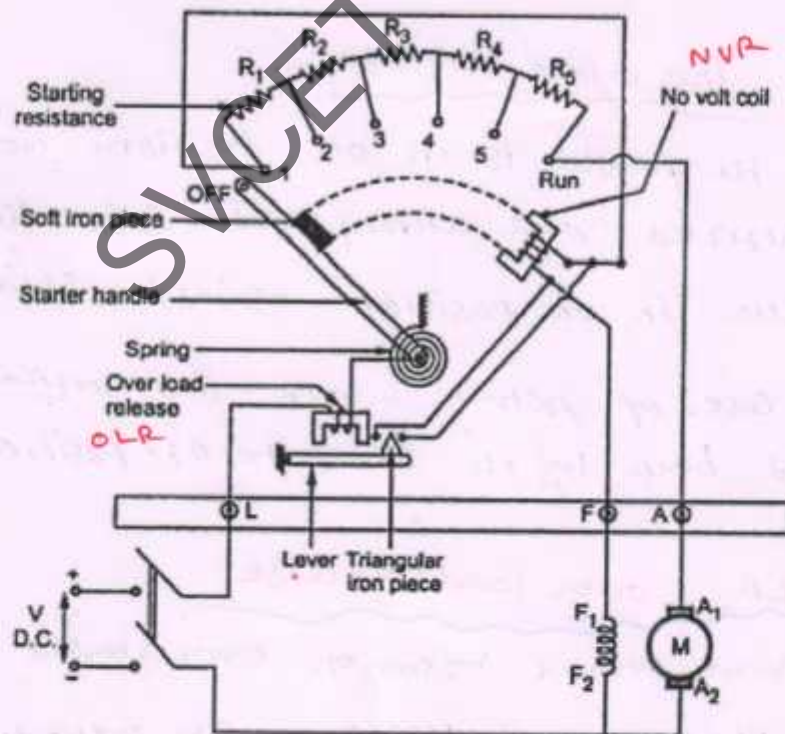
UNIT-3

Starting methods

PART - B

① Draw a neat Schematic diagram of 3 Point Starter. & explain

Starters are used to protect the motor from high starting current.



Starting resistance (R_1 to R_5) is connected in series with a armature of DC motor

No-voltage Release (NVR) is connected in series with Field winding

OLR (over load release) coil is connected in series with a armature.

operation.

When the handle is at stud No 1, Full starting resistance is included in series with the armature. Starting current is reduced.

When handle is further moved resistance cut off gradually, the motor develops back emf when it gathers speed.

Protective devices

(i) NVR (No voltage release)

- When the handle is in ON position, no volt coil is magnetized and attracts the soft iron & keeps handle in ON position against spring tension.

In case of failure - NVR - demagnetized, which is pulled back by the spring to OFF position.

(ii) OLR over load Release

If the motor becomes over loaded beyond a certain predetermined value. The armature current increases, the movable arm is lifted and short circuit the electromagnet (NVR) hence the arm is released and return to OFF position.

Demerit

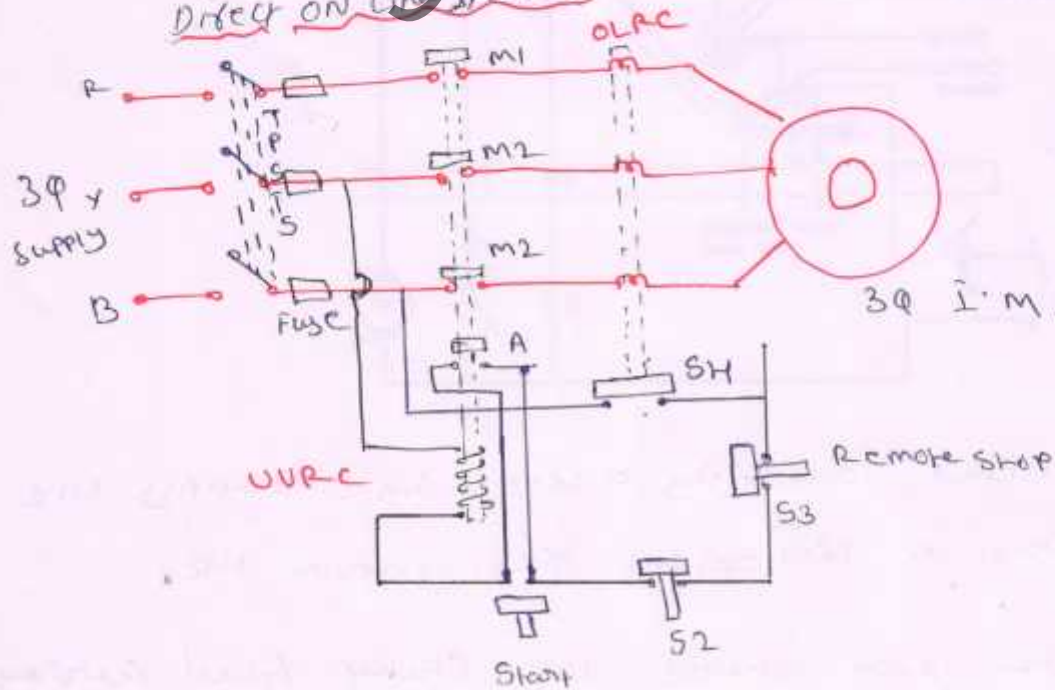
motor speed can be increased by weak flux.

The current passing through the hold on coil because the two circuits are independent - each other.

- It means that the electromagnetic pull exerted by the hold on coil will always be sufficient and will prevent the springs from restoring the handle to OFF position.

③ Explain the different types of starters used in cage induction motor.

Direct on line starter



A motor of small capacity (below 2k) draws only small amount of current, this may not cause much voltage drop in supply line.

Operation:

- TPST is closed, (UVRC) is energized and it will operate main contactor to close.

Full voltage is given to motor and it run.

- Contactor S2 is used to disconnect the supply from motor by manually pressing it.

No voltage protection.

When supply voltage either fail totally (0V) or

fall below certain value. (UVRC) is comes

down & contactor opened.

over load protection.

When line current exceed the preset value

OLRC is energized more and

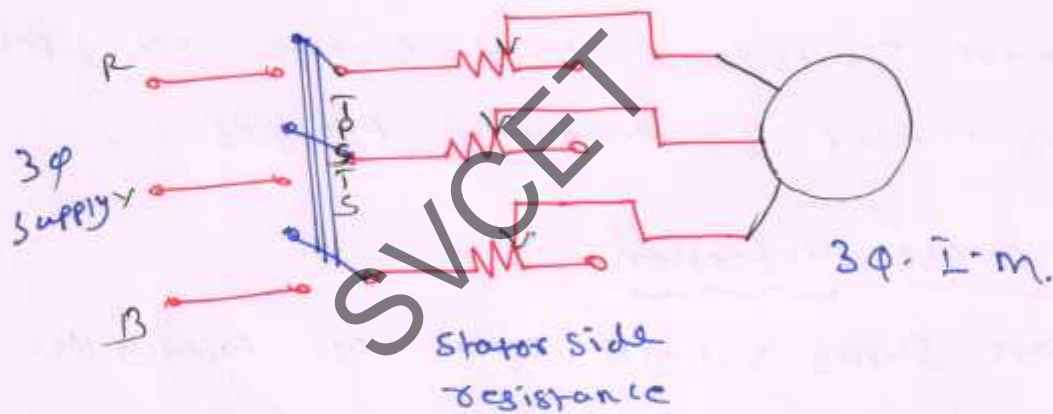
cause the contactor S1 to open.

& UVRC is disconnect from the

supply

Primary resistance starter.

- A variable resistance is connected in series with supply of motor.
- purpose of resistance is to reduce the supply voltage
- reduced voltage is given to motor terminals
reduced voltage limits the starting current.



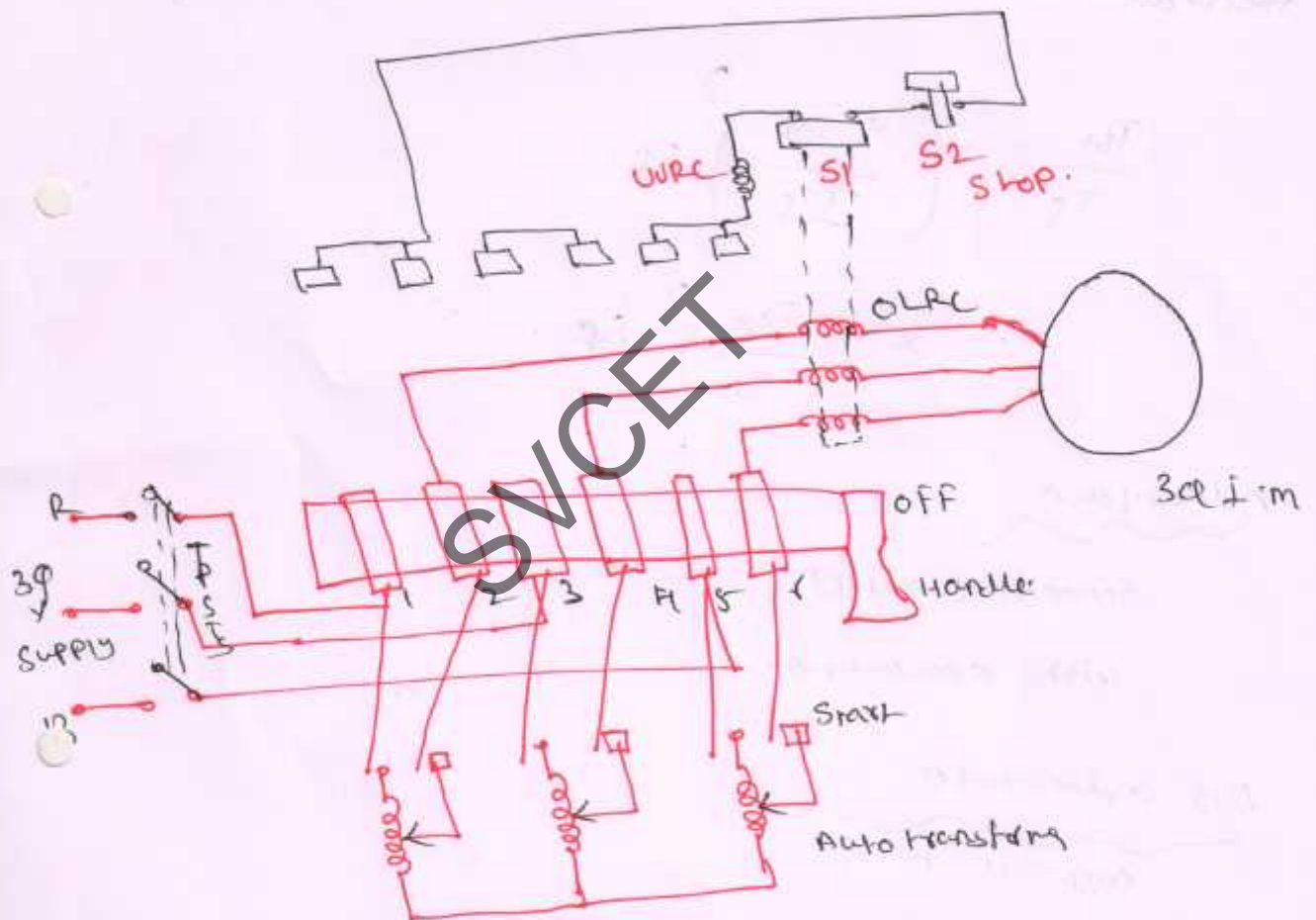
Auto Transformer Starter.

This starter is used to give a reduced voltage to 3φ I.M to limit the starting current.

operation.

When the handle is at start position. The motor is connected through the auto transformer
 \therefore due to reduced voltage and hence starting current is reduced.

When the motor gets 80% of normal speed. The handle is moved to Run position. At the motor receive full line voltage.



over load Protection.

When motor current exceeds the preset value (OLRC) is energized to operate the contactor S1.

Low Voltage Protection

UVRC is connected across two lines. When supply voltage goes low (or) fails UVRC de-energizes and release the handle to OFF position.

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

$$\Rightarrow x^2 \left(\frac{I_{sc}}{I_f} \right)^2 SF.$$

Advantage

- Smooth starting
- High acceleration.

Dis advantage

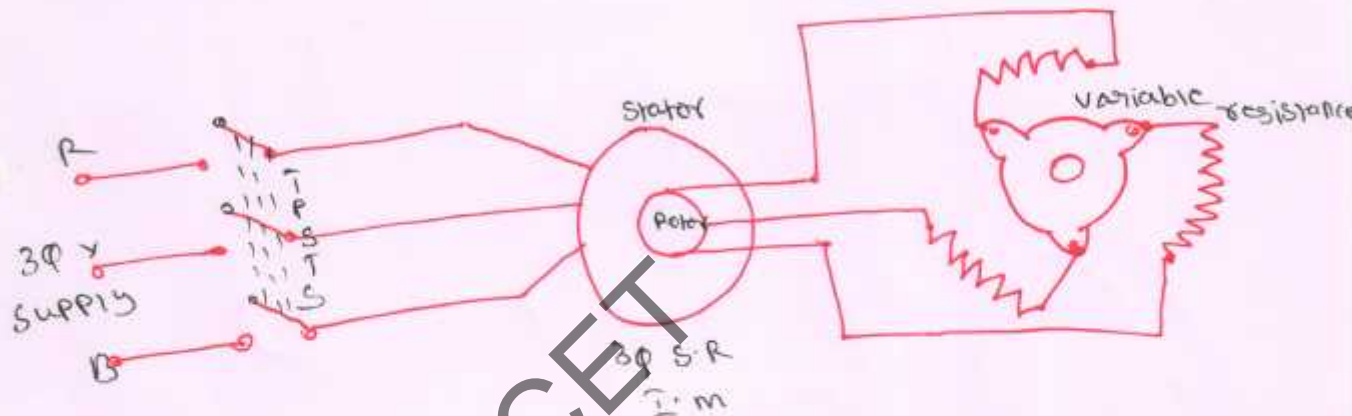
cost is high.

used for only large motor.

Describe rotor rheostatic control used in slip-ring
i.m.

starter used only slip-ring i.m

concept. (a) Starting resistance is connected in rotor circuit



- This motor is always started full line voltage.
- Starting current is adjusted by introducing a variable resistance in rotor circuit.
- At starting full resistance is included and hence starting current is reduced.
- resistance is gradually cut out of rotor circuit as motor gathers speed.