NAME: EZEOBIDI CLEMENTINA ONYINYECHUKWU

COURSE: ELECTRICAL MACHINES II

CODE:326

MATRIC NO:17/ ENG04/027

ASSIGNMENT ON POWER FACTOR CORRECTIONS SYNCHRONOUS MOTORS

QUESTION 1

* The power factor of a synchronous motor is changed with a change in the excitation. When the excitation of the motor is increased, the power factor changes from lagging to unity and then to a leading power factor. This property of the motor is utilized to improve the power factor of the leads, having a low lagging power factor. Normally, when the motor is utilized in this way to improve the factor, the synchronous motor is run without any mechanical load. The excitation is adjusted in such a manner that it works at a leading power factor. The synchronous motor is then referred to a synchronous condenser.

QUESTION 2

* It means that the three phase current entering the stator winding has an angle difference with the voltage. The purpose of using synchronous motors is to use it in leading power factor. By controlling the field current in the rotor

QUESTION 3

* An over-excited synchronous motor has a leading power factor. This makes it useful for power factor correction of industrial loads. Both transformers and induction motors draw lagging (magnetizing ) currents from the line. On light load, the power Drawn by induction motors has large reactive component and power factor has a low value. The added current flowing to supply reactive power creates additional losses in the power system in an industrial plant, synchronous motors can be used to supply some of the reactive power required by the induction motor. This improves the plant power factor and reduces the reactive current required from the grid.

QUESTION 4

* The reason why synchronous motor has better power factor as compared to that of an equivalent induction motor. This is mainly due to ;

i) Synchronous motor has no slip

ii) Mechanical load on the rotor remains constant

iii) Stator supply is not required to produce magnetic field

iv) Synchronous motor has large air gap

QUESTION 5

* Synchronous motors are used for the power factor correction. And as such, the setup of the magnetic flux (which can be considered as the reactive power component) inside the motor is done by the DC excitation provided on the rotor terminals, the power factor can also be controlled by controlling this DC excitation.

QUESTION 6

* A synchronous motor running on no load with leading power factor will act as a synchronous condenser. This is truly not a no load operation since the motor, while behaving as a condenser is actually feeding a part of the reactive load of the system to which it is connected

The same motor when operated with lagging power factor on no load will draw reactive current from the system depending on the system voltage.

However, this doesn’t mean that the can be operated on no load regardless of

The armature current that flows in the motor. The capacity of the motor to run as a synchronous condenser or synchronous motor whether on no load or or load is dictated by its V-curve(Armature current Vs field current)

QUESTION 7

* Like an induction machine, an under excited synchronous machine too will consume reactive power; a properly excited synchronous machine neither consumes nor produces reactive power; an over excited synchronous machine can produce reactive power.

QUESTION 8

* Efficiency is higher than that of an of an induction motor of the same output and voltage rating because because they are neither losses related to slip nor the additional losses due to magnetizing current.

With synchronous motors, there is no difference of speed between air gap rotating magnetic field and rotor

With induction motor, rotating magnetic field and rotor are not at the same speed, so eddy losses introduced by the slip are mainly responsible for reduced efficiency

QUESTION 9

* Power factor of induction motor depends on load and speed. That of a synchronous might be fixed, usually such motors are huge and therefore their reactive power causes huge losses

QUESTION 10

* The real power has nothing to do with it. The real power will be proportional to the mechanical load. If the motor is uncoupled, it will be (close to) zero, regardless of the reactive situation. If the load is consuming power, the motor will take it from the supply to pass on. If the load is supplying power the converse will apply.

QUESTION 11

* Large synchronous motors have adjustable power factor. They can even have leading power factor. They are often set this way compensate for all the other induction motors. This can effect the efficiency of the motor depending on load. With the system tuned to near unity the entire distribution system benefits. It is a good way to go. There is not just one type of synchronous motor but they most often do better than standard induction motors.

QUESTION 12

* Synchronous motor always rotates with synchronous speed, irrespective of the loading conditions. So, the effective output is not reduced, compared to induction motor. So, more efficiency is observed in this case. Also, the operating power factor is constant in synchronous motors. It is also a doubly excited machine, unlike induction motor.

Question 13

* Synchronous motor because are designed to operate at unity (1.0) power factor or 0.8 leading power factor. By varying the DC excitation of the motor, the power factor of the motor can be varied widely.

Synchronous machine have separate DC excitation which reduces machine's excitation dependency on main supply, hence better Power factor . Whereas induction motor have no such provisions, hence low Power factor.

QUESTION 14

* Power factor is a number which in very small length tells us about the efficiency of an AC machine like induction motor. As we know, in an inductive load current lags the voltage by a certain angle. Higher the lag, lesser will be the power factor. The cosine of the angle between Voltage and Current is called power factor.

QUESTION 15

* An over-excited synchronous motor has a leading power factor. This makes it useful for power factor correction of industrial loads. Both transformers and induction motors draw lagging (magnetizing ) currents from the line. On light load, the power Drawn by induction motors has large reactive component and power factor has a low value. The added current flowing to supply reactive power creates additional losses in the power system in an industrial plant, synchronous motors can be used to supply some of the reactive power required by the induction motor. This improves the plant power factor and reduces the reactive current required from the grid.