NAME: OJI UDOCHUKWU

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DEPARTMENT: ELECT ELECT

Question 1

Skin Effect

In case of AC Current, Current flows in Periphery or Skin of Transmission Lines due to Self-Inductance in Conductors. At higher Frequency Skin Effect increases. Due to Skin Effect, Effective Resistance increases. This increases Loss and increase in Temperature.

Increase in Iron Loss in Transformers connected to Generator

Iron Loss consists of Hysteresis Loss and Eddy Current Loss. Hysteresis Loss ∝ f and Eddy Current Loss ∝ f². Thus Iron Loss increases resulting in Higher Loss in Core of Transformer and Temperature is increased.

Crawling in Induction Motor

7th Harmonic creates dip in Torque Speed Curve of Induction Motor at 1/7th the Synchronous Speed. This may result in Induction Motor running at 1/7th the Synchronous Speed. This is called Crawling.

Harmonics is the steady state of distorting the fundamental frequency. With the increasing concern of the effects of harmonic distortion and the lack of documentation of harmonic problems associated with synchronous machines, it is imperative that work to understand the effects of harmonics on synchronous machines be accelerated. This paper evaluates the voltage regulation of a synchronous generator with sinusoidal and distorted voltage waveform conditions. A motor-generator set is employed as an integral part of the power system simulator to supply power to various loads during the performance of the test. Harmonic distortion is introduced by connecting nonlinear loads to produce distorted voltage and current waveforms. To record the electrical and mechanical quantities, a data acquisition system is used. All data acquired is saved for future use in analysis and reporting. The test results show that the voltage regulation of a synchronous generator under various load conditions is related to the different level of harmonic distortion produced by the load. This research provides useful data to develop harmonic standards with better understanding of the impact of harmonics on equipment operation

Retarding Torque in Induction Motor

5th Harmonic produces flux rotating in opposite direction to Main Flux in Induction Motor. This Flux produces Retarding Torque in Induction Motor.

Question 2

This is because

• The phase voltage is 0.577 times the line voltage which results in lesser voltage stress and hence lesser insulation cost.

• The availability of the neutral point which can be grounded and thus provide a path for circulating current in case there is any unbalance in the load end or some fault occurs.

• In star connection there is a neutral availability if there is any problem. And another one is it reduces the high voltage values.

• The armature winding of alternator have a six output terminal, in which three terminal short (make neutral point) and remaining three gives output which are possible only in star connection. So we are connected in star

• Large machines are usually designed for a terminal voltage of several thousand volts. Each stator coil may therefore contain a number of insulated turns of conductor, and each stator winding usually consists of a number of similar coils placed in sequential slots in the stator surface and connected in series

Question 3

The armature is placed in the stationary position reasons go as follows

• Higher peripheral speed can be achieved in the rotor.

• It is easier to insulate stationary winding for high voltages for which the alternators are usually designed. It is because they are not subjected to centrifugal forces and also extra space is available due to the stationary arrangement of the armature.

• Only two slip rings are required for d.c. supply to the field winding on the rotor. Since the exciting current is small, the slip rings and brush gear required are of light construction.

• Due to the simple and robust construction of the rotor, the higher speed of rotating DC field is possible. This increases the output obtainable from a machine of given dimensions

• For large machines (designed to deliver many thousands of volts), the armature is stationary due to difficulties that would arise in insulating the rotor

Question 4

The brushless technology does not have a contact zone, which considerably reduces wearing and maintenance. This is because it has fewer wear parts so less maintenance is needed