VALLIAMMAI ENGINEERING COLLEGE

SRM Nagar, Kattankulathur – 603 203.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

M.E – Power Systems Engineering

PS7006-Industrial Power System Analysis and Design

Odd Semester Academic Year 2014-2015

Unit I

MOTOR STARTING STUDIES

Part-A

1. Give the classification of polyphase induction motor
2. What are the classifications of squirrel cage induction motor as per NEMA?
3. Draw the torque speed characteristics of squirrel cage induction motors based on design?
4. State the advantage of full voltage starting?
5. Represent the effects of starting a large motor?
6. What are the criteria for motor starting study?
7. What are the methods used for starting of motor?
8. What are the data related issues for motor in a power system?
9. State the methods for voltage drop calculation?
10. Write the equation for % voltage drop using impedance method?
11. Write the equation for % Voltage drop using short circuit KVA method?
12. Why is R+jX method more accurate?
13. How dose types of load present affect the voltage drop calculation?
14. State how loaded motors at unity power factor affect the voltage drop?
15. How dose leading power factor motor loads affect the voltage drop?
16. State the effect of initial bus voltage on the drop calculation?
17. Write the equation of time required to accelerate the speed?
18. How dose computer aided analysis help in motor starting studies?
19. Write the dynamic equation of the motor starting function?
20. Write the steps involved in the motor starting simulation?
21. What are the output reports obtained from motor starting?

Part-B

1. Classify squirrel cage motor based on Torque speed characteristics?
2. Present the effects of starting a large motor and explain?
3. Name the starting methods used for large motor and discuss about each in detail?

4. Find the % of tapping required on an auto transformer to start an induction motor against 1/3 of the full load torque, the short circuit current with a normal voltage is 6 times the full load current and the full load slip is 3%?
5. A 3 phase, 6 pole, 60 Hz induction motor takes 60 A at the full load and runs at 1160 Rpm to develop the rated torque. The starting current at rated voltage is 300 A. Calculate the starting torque for online and Y/Delta starting?
6. What are the data related issues for the motor starting in a power system?
7. What are the approaches to calculate voltage drop, explain each in detail?
8. Mention the initial conditions of the power system operation which influence the voltage drop calculation?
9. Give the calculation procedure for acceleration time?
10. Consider a 500 Hp, 460V,1170 rpm,3 phase Induction motor for an application with torque speed characteristics as shown in table .The combined inertia of the motor shaft and the load is 3500lbs-ft^2. The short circuit KVA of the system is 35000KVA.The input to the motor at rated load is 450 KVA. Calculate the acceleration time in seconds using a step by step approach?

Unit II

POWER FACTOR CORRECTION STUDIES

Part-A

1. Define power factor?
2. The power factor of a 1000KVA load is 0.8.IT is necessary to improve the power factor to 0.95. What is the rating of the shunt capacitor bank?
3. Name the power factor correction approaches normally used?
4. What are the assumptions made in power factor case study analysis?
5. What are the factors which ensure satisfactory operation of power factor correction capacitors?
6. How is frequency scan done?
7. How to determine harmonic impedance of a system?
8. Give the equation for steady state voltage following capacitor energisation?
9. Give the switching surge P V values during switching operation?
10. What is insulation co-ordination?
11. What is MCOV capability?
12. Define TRV?
13. What is back to back switching?
14. What are the additional factors that are considered for installation of capacitors?

Part-B

1. What is power factor? State the Importance of power factor and explain the methods in practice for power factor correction?
2. Discuss the power factor correction capacitor project with the help of case study?
3. Discuss in detail about frequency san analysis?
4. Discuss in detail about Voltage magnification analysis?
5. What is sustained over voltage, Explain in detail?
6. How switching surge analysis is done.
7. Explain back to back switching with the help of a problem

Unit III

HARMONIC ANALYSIS

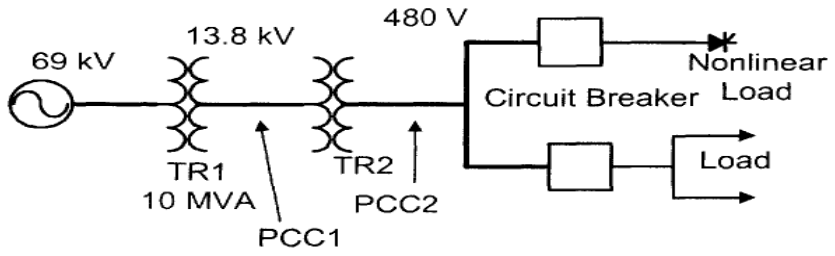
Part-A

1. How does advents of converter affect the power systems?
2. What are the sources of harmonics?
3. State the factors contributing the effect of harmonics of system?
4. What are the datas required for harmonic analysis
5. What are the various factors that are to be kept in limit for system harmonics?
6. What are single tuned filters?
7. Represent the variables of the filter used to describe the filter.
8. Draw the single tuned filter with frequency response characteristics.
9. What are high pass filters?
10. Draw the high pass filters with frequency response characteristics.
11. State the purpose of using multiple filter banks.
12. Draw multiple filters and their frequency response characteristics.
13. Give the equation for voltage rise at the capacitor terminals with inclusion of inductor.
14. Define Total Harmonic Distortion (THD).
15. Define Total Demand Distortion (TDD).
16. Give the formula for finding resonant harmonic number.
17. Give the formula for resonant frequency of high pass filter.
18. What is optimal factor? Give its equation.
19. Draw parallel resonant circuit and its frequency response.
20. Draw series resonant circuit and its frequency response.

Part-B

1. Define harmonics. Name the various sources of harmonics and explain them.
2. What are the important factors contributing to the effects of harmonics on the power systems?

3. What are the general data required to perform power system modeling and computer aided analysis?
4. What are the various acceptance criteria with the limitation of harmonics?
5. What are filters? Explain various filters used for harmonics elimination.
6. Give the various harmonic evaluation terminologies and discuss them in detail.
7. Give a case study on harmonics evaluated using a standard system.
8. A plant is supplied from a 69 kV system through a step down transformer rated to 10 MVA, 69 kV/13.8 kV, delta/wye connected, 8.0% impedance. The step down transformer of the customer is rated to 1 MVA, 13.8kV/480 V, delta/wye connected and 6% impedance. The measured load current at the 480 V level is 900 A. The measured 5th and 7th harmonic currents at the 480 V level (due to converter load) is 100 A and 40 A respectively. Calculate the following: (i) Short circuit current Isc at the point of common coupling at 13.8 kV level.(ii) Short circuit current Isc at the point of common coupling at 13.8 kV level.(iii) Irms at the 480 V level.(iv) TDD at 480 V level.(v) Distortion of 5 harmonic component.(vi) Distortion of 7l harmonic component.(vii) Isc/Iload at the PCC at 13.8 kV level. What is acceptable harmonic level?(viii) Isc/Iload at the PCC at 480 V level. Is this harmonic level acceptable?



Unit-IV

FLICKER ANALYSIS

Part-A

1. What is flicker?
2. What are the various sources of flicker?
3. What is flicker analysis?
4. Give the assumptions made in flicker analysis.
5. Draw the flicker curve from IEEE standard 141.
6. What is phase flicker?

7. Define borderline of visibility.
8. What is borderline of irritation?
9. What are the data required to perform flicker analysis for existing arc furnace?
10. What are the important data for planning studies to measure performance characteristics of the load?
11. Draw the flicker curve from IEEE standard 519.
12. What are the ways to minimize the flicker effects?
13. What is SMES?
14. How does harmonic filter reduce flicker?
15. What is the function of motor-generator set in reducing the flicker effect?
16. How does switched resistance help in reduction of flicker?
17. Draw the svc set up for a fluctuating load.
18. Give the formula for energy stored by super conducting coil in SMES.
19. What is the effect of operating two furnace loads simultaneously?
20. What are the effects of operating of one furnace operation without compensator?

Part-B

1. Define flicker. What are the various sources of flicker, discuss about them in detail.
2. Explain about flicker analysis.
3. Represent various flicker terminologies and their usage in stating the flicker criteria.
4. What are the various data needed to perform flicker analysis and also discuss about data for planning studies to measure the performance characteristics of the load.
5. Discuss flicker analysis using case study of a standard system.
6. Name the methods for minimizing the flicker effects.

Unit-V

GROUND GRID ANALYSIS

Part-A

1. What are the circumstances leading to the shock accidents?
2. What are the allowable limits of body current?
3. What is allowable step voltage?
4. Give the allowable step voltage based on the body weights of 50Kg and 70Kg.
5. What is allowable touch voltage?
6. Give the allowed touch voltage formula for the person with 50kg and 70Kg of body weight.

7. What is transferred potential?
8. Give the steps involved in ground grid calculations.
9. What are the assumptions made for ground grid analysis?
10. Give the average resistivity of various soils.
11. What is the effect of voltage gradient in the measurement of ground resistance and potential gradients in the earth?
12. How does moisture affect the measurement of ground resistance and potential gradients in the earth?
13. How does temperature affect the resistivity of soil?
14. Give the formula for maximum grid current.
15. Name the possible types of ground faults that may occur in the power system.
16. What is the importance of conductor size in the ground system?
17. Give the formula for the step voltage as per IEEE Standard 80-1986.
18. Give the formula for symmetrical ground fault current that flows between the grounding grid and surrounding earth.
19. What is the formula for calculating the length of the buried conductor required to keep the mesh voltage within safety limits?
20. Give the formula for ground grid resistance for the following (i) Flat circular plate (ii) Intermeshed horizontal ground grid. (iii) Closely spaced ground rods.
21. What are the various grounded grids available for computer aided analysis?
22. What are the various data required for conducting ground grid analysis?
23. What are the outputs available from computer aided analysis?
24. What are the various ways to improve the performance of the grounding grids?

Part-B

1. What are the various acceptance criteria with respect to the safety of human in terms of voltage and current?
2. State the procedure for ground grid calculation in detail.
3. Represent the values of ground grid resistance for various steps up voltages.
4. State the methodology for performing ground grid calculation using computer aided analysis.
5. State the methods for improving the performance of the grounding grids.