GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Electrical Engineering

Subject Name : Core Laboratory-I

The laboratory deals with the practical aspects of the three core subjects and the elective subject offered in this semester. It is planned to impart the practical insight of these subjects to the students through the actual implementation, analysis and/or simulation of some of the theories covered in the subjects. The representative outline of the lab is as under:

Core-1:

1. Load flow using Gauss Seidel method
2. Load flow using Newton Raphson method
3. Load flow using Fast Decoupled method
4. Z_{BUS} building algorithm for fault analysis
5. Programme for solution of sparse network equations by optimally ordered triangular factorization
6. Tutorial/Example on State estimation of power system network
7. Solution of differential equation using forward Euler's method, backward Euler's method and trapezoidal method

Core-2:

1. Design of an inductor for a given DC-DC converter configuration. The converter topology and the specifications for the inductor should be specified by the course instructor.
2. Study of V/f control method of the three phase induction motor
3. Observe the output voltage, input current and output current waveform and hence, study the harmonic spectrums of input and output current waveform
4. Also measure the speed, terminal voltage and line current at various frequencies and plot v/f ratio versus speed.

B. Study the performance of a DC drive employing DC chopper.

1. Observe the input and output voltage and currents.
2. Observe the waveforms for low load and high load operation.
3. Study the effect of time-ratio control and/or frequency control on the performance of the motor.

C. Study the firing scheme/circuit of a 3-phase AC voltage controller and hence, observe the output voltage and current of a 3-phase AC-voltage controller (configuration left at the liberty of the instructor) with balanced R and R-L load. Evaluate the harmonic contents in the output waveforms.

D. Study of driver circuits for 3-phase bridge inverter and hence, to operate the inverter in 120°, 150° and 180° mode. Record the output voltage waveforms with R and R-L load and critically evaluate them.

Core-3:

1. Steady state error and stability analysis for the given system using MATLAB.
2. Obtain transient response (Step and Ramp input) for the given control system using MATLAB.
3. Design of P, PI and PID controller for DC motor position control using MATLAB.
4. Design of P, PI and PID controller for digital pendulum system.
5. Design state feedback controller for the DC motor speed control using MATLAB.
6. Design state feedback controller for the pendulum using MATLAB.