List of Experiments

(Electrical & Electronics Engineering)

CIRCUIT ANALYSIS LAB

- Verification of principle of superposition with dc and ac Sources.
- Verification of Thevenin, Norton's theorems in ac circuits.
- Verification of Maximum power transfer theorem.
- Determination of transient response of Current in RL and RC circuits with step voltage input .
- Determination of transient response of current in RLC circuit with step voltage input for under damp, critically damp and over damp cases.
- Determination of frequency response of current in RLC circuit with sinusoidal ac input.
- Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters.
- Determination of driving point and transfer functions of a two-port ladder network and verify Y with theoretical values

ELECTRONICS DEVICES & CIRCUITS LAB

- Study the following devices:
  (a) Analog & digital multimeters (b) Function/ Signal generators (c) Regulated d. c. power supplies (constant voltage and constant current operations) (d) Study of analog CRO, measurement of time period, amplitude, frequency & phase angle using Lissajous figures.
- Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse Saturation current and static & dynamic resistances.
- Plot V-I characteristic of zener diode and study of zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
- Plot frequency response curve for single stage amplifier and to determine gain bandwidth product.
- Plot drain current - drain voltage and drain current - gate bias characteristics of field effect transistor and measure of Idss & Vp
- Application of Diode as clipper & clamper
- Plot gain- frequency characteristic of two stage RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.

- Plot gain- frequency characteristic of emitter follower & find out its input and output resistances.
- Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their h parameters.
- Study half wave rectifier and effect of filters on wave. Also calculate theoretical & practical ripple factor.
- Study bridge rectifier and measure the effect of filter network on D.C. voltage output & ripple factor.

ELECTRICAL AND ELECTRONICS MEASUREMENT LAB

- Measure earth resistance using fall of potential method.
- Plot V-I characteristics & measure open circuit voltage & short circuit current of a solar panel. Measure unknown inductance capacitance resistance using following bridges (a) Anderson Bridge (b) Maxwell Bridge
- To measure unknown frequency & capacitance using Wein's bridge.
- Measurement of the distance with the help of ultrasonic transmitter & receiver.
- Measurement of displacement with the help of LVDT.
- Draw the characteristics of the following temperature transducers: (a) RTD (Pt-100) (b) Thermistors (c) Thermocouple
- Draw the characteristics between temperature & voltage of a K type thermocouple
- Measure the speed of a Table Fan using stroboscope.
- Measurement of strain/ force with the help of strain gauge load cell.
- Study the working of Q-meter and measure Q of coils.
- To study the working of Spectrum analyzer and determine the bandwidth of different signals.

ELECTRICAL MACHINES LAB-I

- Speed control of D.C. shunt motor by (a) Field current control method & plot the curve for speed vs field current. (b) Armature voltage control method & plot the curve for speed vs armature voltage.
- Speed control of a D.C. Motor by Ward Leonard method and to plot the curve for speed vs applied armature voltage.

- To determine the efficiency of D.C. Shunt motor by loss summation (Swinburne's) method.
- To determine the efficiency of two identical D.C. Machine by Hopkinson's regenerative test.
- To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency.
- To perform back-to-back test on two identical 1-phase transformers and find their efficiency & parameters of the equivalent circuit.
- To perform parallel operation of two 1-phase transformers and determine their load sharing.
- To determine the efficiency and voltage regulation of a single-phase transformer by direct loading.
- To perform OC & SC test on a 3-phase transformer & find its efficiency and parameters of its equivalent circuit.
- To perform parallel operation of two 3-phase transformers and determine their load sharing.
- To study the performance of 3-phase transformer for its various connections, i.e. star/star star/delta delta/star and delta/delta and find the magnitude of 3rd harmonic current.

DIGITAL ELECTORNICS LAB

- To study and perform the following experiments.
  (a) Operation of digital multiplexer and demultiplexer. (b) Binary to decimal encoder.
- Characteristics of CMOS integrated circuits.
- To study and perform experiment- Compound logic functions and various combinational circuits based on AND/NAND and OR/NOR Logic blocks.
- To study and perform experiment -Digital to analog and analog to digital converters.
- To study and perform experiment- Various types of counters and shift registers.
- To study and perform experiment - Interfacing of CMOS to TTL and TTL to CMOS ICs.
- To study and perform experiment- BCD to binary conversion on digital IC trainer.
- To study and perform experiment -

(a) Astable (b) Monostable (c) Bistable Multivibrators and the frequency variation with different parameters, observe voltage waveforms at different points of transistor.

- To study and perform experiment -Voltage comparator circuit using IC-710.
- To study and perform experiment- Schmitt transistor binary circuit.
- Design 2 bit binary up/down binary counter on bread board.

APPLIED ELECTRONICS LAB

- Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback.
- Study of series and shunt voltage regulators and measurement of line and load regulation and ripple factor.
- Plot and study the characteristics of small signal amplifier using FET.
- Study of push pull amplifier. Measure variation of output power & distortion with load.
- Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency.
- Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.
  (a) Study the following oscillators and observe the effect of variation of C on oscillator frequency: Hartley (b) Colpitts.
- Design Fabrication and Testing of k-derived filters (LP/HP).
- Study of a Digital Storage CRO and store a transient on it.
- To plot the characteristics of UJT and UJT as relaxation.
- To plot the characteristics of MOSFET and CMOS.

INTEGRATED CIRCUITS LAB

- Op-Amp characteristics and get data for input bias current measure the output-offset voltage and reduce it to zero and calculate slew rate.
- Op-Amp in inverting and non-inverting modes.
- Op-Amp as scalar, summer and voltage follower.
- Op-Amp as differentiator and integrator.
- Design LPF and HPF using Op-Amp 741
- Design Band Pass and Band reject Active filters using Op-Amp 741.

- Design Oscillators using Op-Amp (i) RC phase shift (ii) Hartley (iii) Colpitts
- Design (i) Astable (ii) Monostable multivibrators using IC-555 timer
- Design Triangular & square wave generator using 555 timer.
- Design Amplifier (for given gain) using Bipolar Junction Transistor

POWER ELECTRONICS LAB

- Study the comparison of following power electronics devices regarding ratings, performance characteristics and applications: Power Diode, Power Transistor, Thyristor, Diac, Triac, GTO, MOSFET, MCT and SIT.
- Determine V-I characteristics of SCR and measure forward breakdown voltage, latching and holding currents.
- Find V-I characteristics of TRIAC and DIAC.
- Find output characteristics of MOSFET and IGBT.
- Find transfer characteristics of MOSFET and IGBT.
- Find UJT static emitter characteristics and study the variation in peak point and valley point.
- Study and test firing circuits for SCR-R, RC and UJT firing circuits.
- Study and test 3-phase diode bridge rectifier with R and RL loads. Study the effect of filters.
- Study and obtain waveforms of single-phase half wave controlled rectifier with and without filters. Study the variation of output voltage with respect to firing angle.
- Study and obtain waveforms of single-phase half controlled bridge rectifier with R and RL loads. Study and show the effect of freewheeling diode.
- Study and obtain waveforms of single-phase full controlled bridge converter with R and RL loads. Study and show rectification and inversion operations with and without freewheeling diode.
- Control the speed of a dc motor using single-phase half controlled bridge rectifier andfull controlled bridge rectifier. Plot armature voltage versus speed characteristics.

ELECTERICAL MACHINES LAB-II

- Separation of transformer core losses and to determine the hystersis and eddy current

losses at rated voltage and frequency.

- To plot the O.C.C. & S.C.C. of an alternator and to determine its regulation by synchronous impedance method.
- To synchronize an alternator across the infinite bus (RSEB) & summarize the effects of variation of excitation on load sharing.
- To plot the V-curve for a synchronous motor for different values of loads.
- To perform sumpner's back-to-back test on 3 phase transformers, find its efficiency & parameters for its equivalent circuits.
- To perform the heat run test on a delta/delta connected 3-phase transformer and determine the parameters for its equivalent circuit.
- To perform no load and blocked rotor test on a 3 phase induction motor and to determine the parameters of its equivalent circuits. Draw the circle diagram and compute the following (i) Max. Torque (ii) Current (iii) slip (iv) p.f. (v) Efficiency.
- To perform the load test on a 3-phase induction motor and determine its performance
- characteristics (a) Speed vs load curve (b) p.f. vs load curve (c) Efficiency vs load curve (d) Speed vs torque curve
- Determination of losses and efficiency of an alternator.
- To find Xd and Xq of a salient pole synchronous machine by slip test.

CONTROL SYSTEM LAB

- Introduction to MATLAB Computing Control Software.
- Defining Systems in TF, ZPK form.
- Plot step response of a given TF and system in state-space. Take different values of damping ratio and w_n natural undamped frequency. (b) Plot ramp response.
- For a given 2_{nd} order system plot step response and obtain time response specification.
- To design 1st order R-C circuits and observe its response with the following inputs and trace the curve. (a) Step (b) Ramp (c) Impulse
- To design 2nd order electrical network and study its trarient response for step input and following cases. (a) Under damped system (b) Over damped System. (c) Critically damped system.
- To Study the frequency response of following compensating Networks, plot the graph and final out corner frequencies. (a) Log Network (b) Lead Network (c) Log-lead Network.
- To draw characteristics of a.c servomotor
- To perform experiment on Potentiometer error detector.
- Check for the stability of a given closed loop system.
- Plot bode plot for a 2_{nd} order system and find GM and PM.

POWER SYSTEM DESIGN LAB

- Generating station design**:** Design considerations and basic schemes of hydro, thermal, nuclear and gas power plants. Electrical equipment for power stations,
- Auxiliary power supply scheme for thermal power plant.
- Distribution system Design: Design of feeders & distributors. Calculation of voltage drops in distributors. Calculation of conductor size using Kelvin's law.
- Methods of short term, medium term and long term load forecasting.
  Sending end and receiving end power circle diagrams.
- Instrument Transformers: Design considerations of CTs & PTs for measurement and protection.
- Substations: Types of substations, various bus-bar arrangements**.** Electrical equipment for substations.

MICROPROCESOR LAB

- Study the hardware, functions, memory structure and operation of 8085 microprocessor kit.
- Program to perform integer division: (i) 8-bit by 8-bit (ii) 16-bit by 8-bit.
- Transfer of a block of data in memory to another place in memory in the direct and reverse order.
- Searching a number in an array and finding its parity.
- Sorting of array in: (i) Ascending (ii) Descending order
- Programme to perform following conversion: (i) BCD to ASCII (ii) BCD to Hexadecimal
- Programme to multiply two 8-bit numbers.
- Programme to generate and sum 15 fibanocci numbers.
- Programme for rolling display of message "INDIAN".
- To insert a number at correct place in a sorted array.
- Serial and Parallel data transfer on output port 8155 & 8255 & designing of disco light, running light, and sequential lights on off by above hardware.
- Generation of different waveform on 8253/ 8254 programmable timer.

POWER SYSTEM LAB

- Study the burden effect on the performance of CT and measure ratio error.
- Find out the sequence components of currents in three 1-Phase transformers and 3-Phase transformer and compare their results.
- Study over current relay.
- Draw the current-time characteristic of an over current relay for TMS=1 & 0.5 and PSM=1.25 & 1.0.
- Study percentage bias differential relay.
- Plot the characteristics of a percentage bias differential relay for 20%, 30% and 40% biasing.
- Study gas actuated Buchholz relay.

MATLAB PROGRAMMING LAB

- Basics of MATLAB matrices and vectors, matrix and array operations, Saving and loading data, plotting simple graphs, scripts and functions, Script files, Function files, Global Variables, Loops, Branches, Control flow, Advanced data objects, Multidimensional matrices, Structures, Applications in linear algebra curve fitting and interpolation. Numerical integration, Ordinary differential equation. (All contents is to be covered with tutorial sheets)
- **Simulink:** Idea about simulink, problems based on simulink. (All contents is to be covered with tutorial sheets)

ADVANCED POWER ELECTRONICS LAB

- Study and test AC voltage regulators using triac, antiparallel thyristors and triac & diac.
- Study and test single phase PWM inverter.
- Study and test buck, boost and buck- boost regulators. 4
- Study and test MOSFET chopper.
- Study and test Zero voltage switching.
- Study and test SCR DC circuit breaker.
- Control speed of a dc motor using a chopper and plot armature voltage versus speed characteristic.

- Control speed of a single-phase induction motor using single phase AC voltage regulator.
- Study single-phase dual converter. (ii) Study speed control of dc motor using single phase dual converter.
- Study one, two and four quadrant choppers (DC-DC converters).
- Study speed control of dc motor using one, two and four quadrant choppers.
- Study single-phase cycloconverter.

ELECTRICAL DRIVES AND CONTROL LAB

- Study and test the firing circuit of three phase half controlled bridge converter.
- Study and obtain waveforms of 3 phase half controlled bridge converter with R and RL loads.
- Study and test the firing circuit of 3-phase full controlled bridge converter.
- Study and obtain waveforms of 3-phase full controlled bridge converter with R and RL loads.
- Study and test 3-phase AC voltage regulator.
- Control speed of dc motor using 3-phase half controlled bridge converter. Plot armature voltage versus speed characteristic.
- Control speed of dc motor using 3-phase full controlled bridge converter. Plot armature voltage versus speed characteristic.
- Control speed of a 3-phase induction motor in variable stator voltage mode using 3-phase AC voltage regulator.
- Control speed of universal motor using AC voltage regulator.
- Study 3-phase dual converter.
- Study speed control of dc motor using 3-phase dual converter.
- Study three-phase cycloconverter and speed control of synchronous motor using cycloconverter.
- Control of 3-Phase Induction Motor in variable frequency V/f constant mode using 3-phase inverter.