LECTURE NOTES

On

Power Electronics & PLC

Of

5th Semester Electrical Engineering Branch

Prepared By

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SYLLABUS

COURSE CONTENT :-

1 UNDERSTAND THE CONSTRUCTION AND WORKING OF POWER ELECTRONIC DEVICES :-

1.1 Construction, operation, V-I characteristics & application of power diode, SCR, DIAC, TRIAC power MOSFET, GTO & IGBT.

1.2 Two transistor analogy of SCR.

1.3 Gate characteristics of SCR.

1.4 Switching characteristic of SCR during turn on and turn off.

1.5 Turn on methods of SCR.

1.6 turn off methods of SCR (Line commutation and forced commutation)

1.6.1 Load commutation

1.6.2 Resonant pulse commutation

1.7 Voltage and current ratings of SCR.

1.8 protection of SCR

1.8.1 over voltage protection

1.8.2 over current protection

1.8.3 Gate protection

1.9 Firing Circuits.

1.9.1 General layout diagram of firing circuit.

1.9.2 R firing circuit

1.9.3 R-C firing circuit

1.9.4 UJT pulse trigger circuit.

1.9.5 Synchronous triggering (Ramp triggering).

1.10 Design of Snubber circuits.

2. UNDERSTAND THE WORKING OF CONVERTERS, AC REGULATORS AND CHOPPERS.

2.1 Controlled rectifiers techniques (Phase Angle Extinction Angle control), single quadrant semi converter, two quadrant full converter & dual converter.

2.2 Working of single-phase half wave controlled converter with Resistive and R-L loads.

2.3 Understand need of freewheeling diode.

2.4 Working of single phase fully controlled converter with resistive and R-L loads.

2.5 Working of 3-ϕ half wave controlled converter with Resistive load.

2.6 Working of 3-ϕ fully controlled converter with resistive load.

2.7 Working of 1-ϕ AC regulator.

2.8 Working principle of step up & step down Chopper.

2.9 control modes of Chopper.

2.10 ☺peration of chopper in all four quadrants.

3. UNDERSTAND THE INVERTERS AND CYCLO-CONVERTERS :-

3.1 Classify Inverters.

3.2 Explain the working of series inverter.

3.3 Explain the working of parallel inverter.

3.4 Explain the working of single-phase bridge inverter.

3.5 Explain the basic principle of cyclo-converter.

3.6 Explain the working of single-phase step-up & step-down cyclo-converter.

3.7 Applications of cyclo-converter.

4. UNDERSTAND THE APPLICATIONS OF POWER ELECTRONIC CIRCUITS :→

4.1 List applications of power Electronic ckts.

4.2 List the factors affecting the speed of DC Motors.

4.3 Speed control for DC shunt motor using converter.

4.4 Speed control for DC shunt motor using Chopper

4.5 List the factors affecting speed of the AC Motors.

4.6 Speed control of induction Motor by using Ac voltage regulator.

4.7 Speed control of induction Motor by using converters and inverters (V/F control).

4.8 Working of UPS with block diagram.

4.9 Battery charger circuit using SCR with the help of a diagram.

4.10 Basic Switched Mode power Supply (SMPS) - Explain its working & applications.

5 PLC AND ITS APPLICATIONS :-

5.1 Introduction of programmable Logic controller (PLC)

5.2 Advantages of PLC

5.3 Different parts of PLC by drawing the Block diagram and purpose of Each part of PLC.

5.4 Applications of PLC.

5.5 Ladder diagram.

5.6 Descriptions of contacts and coils in the following states

(i) Normally open
(ii) Normally closed
(iii) Energized output
(iv) latched output
(v) branching

5.7 Ladder diagrams for

(i) AND gate
(ii) OR gate
(iii) NOT gate

5.8 Ladder diagrams for combination ckt using NAND, NOR, AND, OR and NOT

5.9 Timers

(i) T ON
(ii) T Off

(iii) Retentive timer

5.10 Counters - CTU, CTD

5.11 Ladder diagrams using Timers and Counters

5.12 PLC instruction set.

5.13 Ladder diagrams for following.

(i) DOL starter and STAR-DELTA Starter.

(ii) Stair case lighting

(iii) Traffic light control

(iv) Temperature controller

5.14 Special control systems - Basics DCS & SCADA systems

5.15 Computer control - Data Acquisition, Direct Digital control system (Basics only)

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