

Paper Code: ABEC-201
Paper: Digital and Power Electronics
Final Exam Duration: 3 Hrs

L	P	C
3	1	4

Total Marks: 100 TH: 50 Pr.50
External Marks (TH):35
Internal Marks (TH): 15

Course Objectives:

The course should enable the students to:

1. To simplify the mathematical expressions using Boolean functions – simple problem
2. Study & design the combinational & sequential circuits.
3. Get an overview of different types of power semiconductor devices and their Switching characteristics.
4. Learn the inverters and converters.

Learning Outcomes:-:

Learner will be able to...

1. Understand the basic gates and the number.
2. To simplify Boolean function.
3. Discuss tradeoffs involved in power semiconductor switches.
4. Analyze different types of power converters.
5. Analyze issues involved in controlling of AC and DC drives.
6. Realize drive considerations for different industrial applications.
- 7.

Skill Set:

1. Knowledge of digital and power devices.
2. Working and maintenance knowledge of converters, inverters and semi-conductor switches.

1. Introduction:

- 1.1. Logic Levels and Pulse Waveforms
- 1.2. Elements and Functions of Digital Logic
- 1.3. Digital Integrated Circuits
- 1.4. Number system and codes
- 1.5. AND, OR, NAND, NOR, Gate Propagation Delay Time, Power Dissipation Norse Immunity, Fan In & Out, Loading Considerations
- 1.6. AND – OR Logic AOL Logic, XOR Logic, Universal Properly of NAND and NOR Logic – Half and Full Adders
- 1.7. Decoders and Encoders – Multiplexers and De-multiplexers

2. Boolean Algebra and Latches:

- 2.1 Boolean Operations, Logic Expressions
- 2.2 Rules and Laws of Boolean Algebra DE Morgan's Theorem
- 2.3 Simplifications of Boolean Expressions, Karnaugh Map
- 2.4 Flip Flops, Different Types of Flip Flops, Flip Flops Operations, Operating Characteristics, Applications of Flip Flops.

3. Power Semi-Conductor Devices

- 3.1 Study of switching devices

- 3.2 Diode, SCR, TRIAC, GTO, BJT, MOSFET, IGBT-Static and Dynamic characteristics, Triggering and commutation circuit for SCR
- 3.3 Design of Driver and Snubber circuit.

4 **Cyclo Converter**

- 1.1 Principle of Cyclo-converter operation.
- 1.2 Single phase to single phase circuit step up Cyclo converter
- 1.3 Single phase to single phase circuit step down Cyclo converter

4 **Inverters**

- 4.1 Single phase and three phase voltage source inverters (both 1200 mod and 1800 mode)
- 4.2 Voltage & harmonic control
- 4.3 WM techniques: Sinusoidal PWM, modified sinusoidal PWM - multiple PWM
- 4.4 Introduction to space vector modulation
- 4.5 Current source inverter

Text Books:

- 1. **Morris Mano M., —Digital Circuits and Logic Design, Prentice Hall of India, II Edition, 1996.**
- 2. **Reshid, M.H., Power Electronics – Circuits Devices and Application, Prentice Hall International, New Delhi, 3rd Edition, 2004.**

Paper Code: ABEC-201 P
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L	P	C
	1	1
	Total Marks: 50 (Pr)	
	External Marks (PR):15	
	Internal Marks (PR): 35	

List of Experiments:

1. Single phase Semi / Full Converter with R & R-L load.
2. **Three phase Semi / Full Converter with R load.**
3. Single phase AC voltage controller using SCRs for R load
4. **Single-Phase PWM bridge inverter for R load.**
5. Configuring NAND and NOR logic gates as universal gates.
6. Implementation of Boolean Logic Functions using logic gates and combinational circuits
7. Getting familiar with various digital integrated circuits of different logic families. Study of data sheet of these circuits and see how to test these circuits using Digital IC Tester
8. Digital IC Testers and Logic State Analyzer as well as digital pattern generators should be demonstrated to the students.
9. Verification of state tables of RS, JK, T and D flip-flops
10. Implementation & verification of Decoder/Demultiplexer and Encoder using logic gates