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| **ECL4501** | **Digital Electronics Lab** | **L-T-P: 0-0-3; Total 12 sessions** |

***Prerequisites*:** i) Elements of Electronics Engineering

***Objective*:** This lab course indented to make students familiar with all varieties of Digital Circuits (both combinational & sequential circuits) & timing circuits, their design & applications along with Analog to Digital & Digital to Analog conversion.

***Course Outcome***: Upon successful completion of this course, students should be able to:

* Learn the basic methods for the design of digital circuits and provide the fundamental concepts used in the design of digital systems.
* Understand and design combinational circuits such as logic gates, adder, subtractor, parity generator and checker, Decoder, Multiplexer and De-multiplexer.
* Understand and design sequential circuits such as flip-flops, shift registers, counters
* Design astable and monostable multivibrator using IC-555.
* Analyze and design various analog to digital & digital to analog converters
* Design digital circuits using MultiSIM

**List of Experiments**

Experiment No.-01: Universal Gates (i) Identification and verification of NAND gate (IC #7400) and NOR gate (IC #7402). (ii) Construction and Verification of all other gate (AND, OR, NOT, XOR) USING a) Only NAND gate b) Only NOR gate

Experiment No.-02: Code Convertor & Parity Generator and checker. (i) Identification & verification of NOT (7404), AND (7408) OR (7432) & XOR (7486) gates. (ii) Design, construction and verification of 3-bit Binary to Gray convertor and 3-bit Grey to Binary convertor circuit. (iii) Design, construction and verification of 3-bit odd/even Parity Generator and 4-bit odd/even parity checker circuit.

Experiment No.-03: Adder, Subtractor & Magnitude comparator circuits. (i) Design, construction and verification of Half Adder and Half Subtractor circuit. (ii) Design, construction and verification of Full Adder and Full Subtractor circuit. (iii) Design, construction and verification of 1-bit and 4-bit Magnitude comparator. (iv) BCD Adder/Subtractor

Experiment No.-04: Decoder, MUX & DMUX (i) Construction and verification of BCD to 7-segment decoder using IC # 7447 (ii) Verification of 4:1 MUX, 8:1 MUX & 16:1 MUX.

(iii) Verification of 1:4 DMUX, 1:8 DMUX (iv) Cascading of MUIX and Cascading of Decoders.

Experiment No.-05: Latches and Flip Flops (i)Construction and Verification of a Latch circuit using NAND/NOR gates. (ii) Construction and Verification of S-R Flip Flop using above Latch circuits. (iii) Verification of J-K Flip Flop using IC # 7476 (Dual J-KFF) (iv) Construction and Verification of D-Flip Flop and T-Flip Flop using J-K FF (IC #7476). (v) Construction and Verification of Master Slave J-K Flip Flop.

Experiment No.-06: Shift Registers (i) Verification of D-FF using IC # 7474 (Dual D- FF). (ii) Construction and verification of a 2-bit Shift Right Register using IC # 7474 (iii) Construction and verification of a 2-bit Shift Left Register using IC # 7474 (iv) Verification of SISO, SIPO, PISO & PIPO Shift Registers.

Experiment No.-07: Synchronous & Asynchronous Counters (i) Construction and verification of 2-bit Ripple counter using J-K FF. (ii) Construction and verification of Mod-3 up and Mod-3 down synchronous counter. (iii) Construction and verification of 2-bit Ring counter using J-K FF. (iv) Construction and verification of 2-bit twisted Ring (Johnson) counter using J-K FF.

Experiment No.-08: Design and construction of a 4 bit sequence generator

Experiment No.-09: Digital to Analog Converter (DAC). Construction & Verification of D/A converters using following methods.

a) Weighted Resistor type

b) R-2R ladder network type

Experiment No.-10: Analog to Digital Converter (ADC). Construction & Verification of A/D Converter using following methods.

a) Counter type

b) Successive Approximation type

Experiment No.-11: Familiarization with multisim. Design of various Digital Circuits using Multisim.

**Text Books**:

1. Digital Systems- Principles & Applications by Tocci, Widmar and Jain, Pearsons

2. Digital Fundamentals by Floyd and Jain, Pearson

3. Digital Circuits (Vol-I & vol-II) By D. Roychowdhary, Platinum Publishers