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B.E. Semester III EXAMINATION (April-2025)

Subject Code: CT304-N
Date: 29/04/2025 **Time:10:00am to 1:00pm** **Subject Name: Digital Electronics**
Total Marks: 70 Marks

Instructions:
1. **All questions are compulsory.**
2. **Figures to the right indicate full marks.**
3. **Use of scientific calculator is permitted.**
4. **Indicate clearly, the options you attempt along with its respective question number.**
5. **Use the last page of main supplementary for rough work.**

Section-I

Q:1 Attempt Following.

(A) (i) Convert $(725)_8$ (octal) to binary and hexadecimal.
(ii) Convert $(101101.101)_2$ (binary) to decimal and octal. [5]

(B) (i) Convert $(2F3)_{16}$ (hexadecimal) to binary and decimal.
(II) Convert $(187)_{10}$ (decimal) to binary and hexadecimal. [5]

(C) Why is the binary number system used in computers instead of the decimal system? What are the advantages of using the hexadecimal number system in computing? [5]

OR

Q:1 (C) Perform $(1101)_2 - (1010)_2$ using 2's complement method.
Multiply $(1011)_2 \times (110)_2$ in binary. [5]

Q:2 Answer the following question.

(A) How can a NAND gate be used to implement all basic logic gates (AND, OR, NOT) [5]

(B) Why is NAND logic preferred in digital circuit design for cost and efficiency reasons? [5]

OR

Q:2 (A) Design the XOR function **F(A, B) = A ⊕ B** using a **2-variable K-map.** [5]

(B) A Boolean function is given as: [5]
$F(A,B,C)=\sum m(1,2,3,5,6)$
Use a 3-variable K-map to simplify the function.

Q:3 Answer the following question.

(A) Design Full adder circuit and explain its working. [5]

(B) Design 3-bit Binary Parallel Adder and explain how does it work? [5]

OR

Q:3 (A) What is a Magnitude Comparator, and where is it used? [5]

(B) Distinguish between: i) Master-Slave Flip Flop and Regular Flip Flop ii) Level Triggered Flip Flop and Edge Triggered flip flop? [5]

Section II

Q:4 Attempt following.

(A) What are the basic components of a state machine? What is the difference between a Mealy and a Moore state machine? [5]

(B) How does a synchronous state machine differ from an asynchronous state machine? [5]

(C) Design 4-bit synchronous counters using D flip-flops and explain its working. [5]

OR

Q:4 (C) How can a J-K flip-flop be designed to work as a T flip-flop? [5]

Q:5 Answer the following question.

(A) Distinguish between Programmable Logic Arrays (PLA) and Programmable Array Logic (PAL)? [5]

(B) Write Short note of flash ADC. [5]

OR

Q:5 (A) What is the role of a Dual Slope A/D converter, and in which applications is it commonly used [5]

(B) Why do state machines require flip-flops for storing states? [5]

Q:6 Answer the following question.

(A) Design a 4-bit shift register **using** D flip-flops that shifts data to the right on every clock pulse. [5]

(B) What is the difference between an R-2R Ladder DAC and a Binary Weighted Resistor DAC? [5]

OR

Q:6 (A) Construct **a** D flip-flop using an S-R flip-flop and basic gates. [5]

(B) What is the main function of a Digital-to-Analog (D/A) converter, and where is it used? [5]