**PRESIDENCY UNIVERSITY
BENGALURU**   **SET A**

SCHOOL OF INFORMATION SCIENCE
END TERM EXAMINATION - JAN 2024

Semester : Semester I - 2023   **Date :** 11-JAN-2024
Course Code : ECE2009   **Time :** 1:00 PM - 4:00 PM
Course Name : Digital Computer Fundamentals   **Max Marks :** 100
Program : BCA   **Weightage :** 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS   **5X4M=20M**

1. There are 16 input combinations in a digital system, how many minimum variables are required to frame a Boolean Function ?

   (CO1) [Knowledge]

2. A digital system can understand positional number system only where there are a few symbols called digits and these symbols represent different values depending on the position they occupy in the number. In Boolean Algebra: i. $A + A'B =$ _____   ii. $A . A' =$ _____

   (CO1) [Knowledge]

3. Addition is one of the most basic operations performed by different electronic devices like computers, calculators, etc. The electronic circuit that performs the addition of two or more numbers, more specifically binary numbers, is called as adder. Express Full subtractor output expressions.

   (CO2) [Knowledge]

4. Basic shift registers are classified by structure according to the following types: Serial-in/serial-out. Parallel-in/serial-out. Serial-in/parallel-out. What is the role of shift register.

   (CO2) [Knowledge]

5. A Flip Flop is a basic storage element. Which condition is shown in J-K flip flop as no changes next state from present state.

   (CO2) [Knowledge]

ANSWER ALL THE QUESTIONS   **5X10M=50M**

6. A transducer is a device that has the capability to emit data as well as to accept. Transducer converts signal from one form of energy to another. How the encoder is similar to the multiplexer. State using truth table of 8x3 encoder.

(CO3) [Comprehension]

7. Minterms are called products because they are the logical AND of a set of variables,and maxterms are called sums because they are the logical OR of a set of variables. Realize the given K-Map using SOP and POS expression.

Note: Simplify the K-map, consider 1's for SOP and 0's for POS.

(CO2) [Comprehension]

8. Consider a 3- input logic gate,if both the inputs of gate is equal to zero, then the corresponding output of the gate is zero , for rest of input condition output goes high. Design the given scenario using NAND gates only.
    Note: Design with the help of truth table

(CO2) [Comprehension]

9. A multiplexer (MUX) is a combinational circuit that can receive multiple input signals and synthesize a single output signal based on the select inputs. Implement the following Boolean expression
    $f(A, B, C)= \sum m=(0, 1, 2, 4, 7)$ using 4x1 MUX.

(CO2) [Comprehension]

10. A Synchronous counter is the counter in which the clock input with all the flip-flops uses the same source and produces the output at the same time. Design a 2-bit synchronous Up-counter using required steps.

(CO3) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS   **2X15M=30M**

11. Flip-flops are used for temporary data storage, as frequency dividers and in counters. Typically, for data storage applications, a group of flip-flops are connected to parallel data lines and clocked together. How does a J-K flip-flop differ from an S-R flip-flop in its operation? Depict using JK circuit diagram and excitation table.

(CO3) [Application]

12. The video game controller uses multiple combinations of control buttons to move the subject in a particular game which is a basic example office use of registers. Registers are also used to store temporary data and to produce delay in the circuit. Explain the basics of PIPO, SISO operation in registers with the help of proper circuit diagram.

(CO3) [Application]