PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2023

Date : 4-JAN-2023
Time : 1.00PM - 4.00PM
Max Marks : 100
Weightage : 50%

Semester : Semester III - 2021
Course Code : ECE2007
Course Name : Sem III - ECE2007 - Digital Design
Program : B.Tech. CSE & COM

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.

PART A

ANSWER ALL THE FIVE QUESTIONS   **5 X 2 = 10M**

1. Consider a TWO input logic gate, if both the inputs is zero, then the corresponding output of the gate is zero, and for the rest of the input conditions, the output goes high. Match the logic function with the given logic gate.

                                                   (CO3,CO2,CO1,CO5,CO4) [Knowledge]

2. JK flip flop is one of the most used flip flops in digital circuits,In JK flipflop which input combinations produce the SET state?

                                                   (CO3,CO2,CO1,CO5,CO4) [Knowledge]

3. While designing the PoS Boolean function (A+B)(A+C)(B+C) using NOR gates only, how many minimum number of NOR gateS are required? (a) 4 (b) 5 (c) 3 (d) 1

                                                   (CO1,CO5,CO4,CO2,CO3) [Knowledge]

4. A sequential circuit refers to a special type of circuit where the outputs depend on a combination of both the present inputs as well as the previous outputs. So, to design a 3-bit asynchronous up-counter, how many flip flops required and mention the number of states using state diagram.

                                                   (CO1,CO2,CO3,CO4,CO5) [Knowledge]

5. Decoder circuits are used in addressing core memory in a computer, where we have a specified memory location to store the input data. What is decoder. How the decoder is similar to the demultiplexer.

                                                   (CO4,CO5,CO3,CO1,CO2) [Knowledge]

PART B

ANSWER ALL THE TWO QUESTIONS   **2 X 15 = 30M**

6. The inputs to a circuit are the 4 bits of the binary number D3D2D1D0 .The circuit produces a 1 if and only if all of the following conditions hold.
   i) MSB is '1' or any of the other bits are a '0'.
   ii) D2 is a 1 or any of the other bits are a '0'.
   iii) Any of the 4 bits are a 0
   obtain a minimal expression for the output.

                                                   (CO1,CO3,CO2,CO4,CO5) [Comprehension]

7. A multiplexer is a combinational circuit that has 2n input lines and a single output line. The multiplexer, shortened to "MUX" or "MPX", is a combinational logic circuit
   a. How many select lines does a 32 : 1 MUX need?
   b. Given SOP function f(A, B, C) = m(0, 1, 4, 6, 7) . Use an 4:1 MUX to implement it
   c. Implementing 16:1 Multiplexer using 4:1 Multiplexers

<div align="right">(CO5,CO1,CO2,CO4,CO3) [Comprehension]</div>

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PART C

ANSWER ALL THE THREE QUESTIONS   **3 X 20 = 60M**

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8. The digital system designer has a task to design the digital circuit. The circuit given below is the part of the very large digital circuit system. Use the given circuit and find the output expression of the given circuit and write the truth table for the same.

   a.

   b.
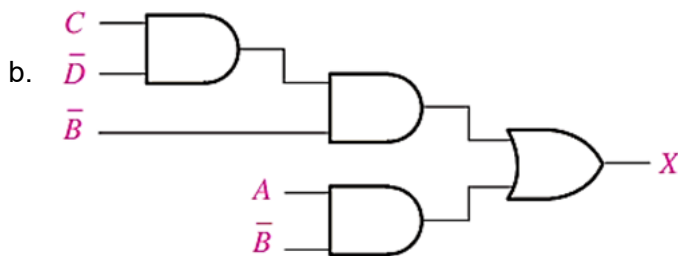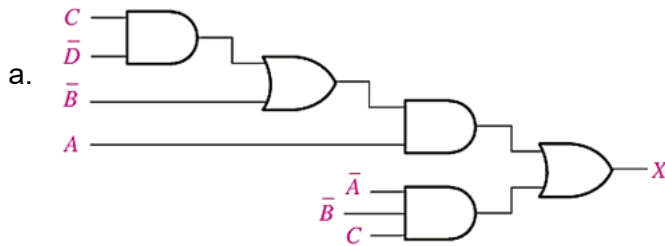
<div align="right">(CO1,CO2,CO3,CO5,CO4) [Application]</div>

9. A digital system is to be designed in which the month of the year is given as input is four bit form. The month January is represented as '0000', February '0001' and so on. The output of the system should be '1' corresponding to the input of the month containing 31 days or otherwise it is '0'. Consider the excess numbers in the input beyond '1011' as don't care conditions for system of four variables (A, B, C, D).
   i) Write the truth table
   ii)Design and implement the simplified logic using LOGICAL GATES.
   ii) Design and implement the simplified logic using 8:1 MUX

<div align="right">(CO2,CO3,CO4,CO5,CO1) [Application]</div>

10. a) Write whether the below expression is an SOP or POS expression and what is the full-form? Write whether the below expression is a min-term or max-term expression? How many variable K-map we need to simplify the below expression?
   f=$\Pi M(2,8,9,10,11,12,14)$

   b) Draw the K-map and simplify the above expression by showing all the steps.

   c) Implement the simplified expression obtained in Part (b) using basic gates.

   d) Implement the simplified expression obtained in Part (b) using NOR gates.

<div align="right">(CO1,CO2,CO3,CO4,CO5) [Application]</div>

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