

National Institute of Technology Rourkela
Department of Computer Science & Engineering
Mid-Semester Examination(Autumn), 2019

Subject: Digital System Design

Full Marks: 30

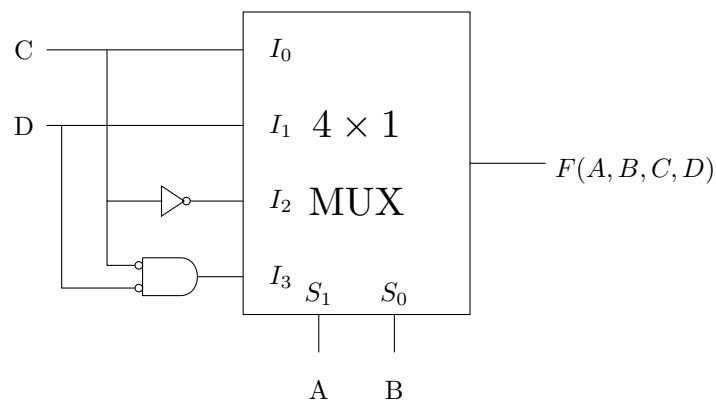
Subject Code: CS-2001

Duration: 2 Hours

Answer all questions.

Figures at the right margin indicate marks. All parts of a question must be answered at one place.

1. (a) A circuit receives a 4 bit excess-3 code. Design a combinational circuit to detect the decimal numbers 0, 1, 4, 6, 7, 8. [3]
(b) Add -89.75 to 43.25 using 12 bit 1's complement method. [2]
(c) Find 16's complement of F20.3AE [1]
2. (a) Realize $ABC\bar{C}$ using minimum number of 2 input NAND gates. Also realize $AB + C$ using minimum number of 2 input NOR gates. Note that only true variables are present. [3]
(b) Expand $\bar{A} + \bar{B}$ to minterms and maxterms. [2]
(c) Reduce the expression $A(B + \overline{C(AB + AC)})$ [1]
3. (a) Implement the Combinational logic function $F(A, B, C, D) = \Pi(0, 2, 4, 5, 6, 10, 11, 12)$ using a 8×1 MUX taking C in the input lines. [3]
(b) Draw the logic diagram of 1:16 DEMUX using 1:4 DEMUX. [2]
(c) Find the essential prime implicants of the Function $F(A, B, C, D) = \sum(2, 3, 5, 6, 7, 10, 11, 14, 15)$. [1]
4. (a) Design a 2 bit comparator using suitable decoder. [3]
(b) A bulb in a staircases has two switches, one switch being at the ground floor and the other one at the first floor. The bulb can be turned **ON** and also can be turned **OFF** by and one of the switches irrespective of the state of the other switch. Find the logic expression for switching of the bulb. [2]
(c) Find the 2's complement representation of $(-539)_{10}$ in hexadecimal. [1]
5. (a) Design a 32:1 MUX using multiple 8:1 MUX. [3]
(b) Find the Boolean function realized by the logic circuit shown below. [2]



- (c) P is a 16 bit signed integer. The 2's complement representation of P is $(F87B)_{16}$. Find the 2's complement representation of $8 * P$. [1]