Classwork 03 CPE221 Computer Organization

Instructor: Rahul Bhadani

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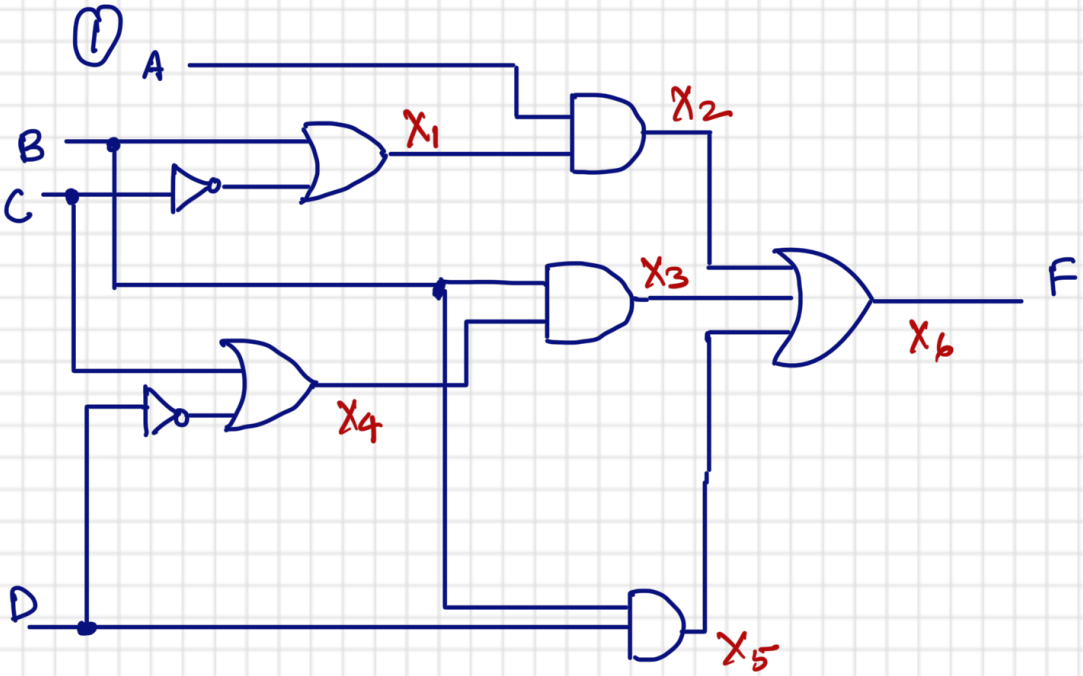
Total Marks = 20

Student's Name: _____

① (5 points)




Write down the boolean expression for $X_1, X_3, X_4, X_5$ $X_6$. For example $X_2 = A \cdot (B + \bar{C})$

Answer:

$X_1 = B + \bar{C}$ $\quad X_4 = C + \bar{D}$

$X_3 = B \cdot (C + \bar{D})$ $\quad X_5 = B \cdot D$

$X_6 = A \cdot (B + \bar{C}) + B \cdot (C + \bar{D}) + (B \cdot D)$

(2) Convert 1234.125 to binary. (Not IEEE754 floating format)

(5 points)

Answer:

1234 =

| | | |
|---|---|---|
| 2 | 1234 | |
| 2 | 617 | 0 |
| 2 | 308 | 1 |
| 2 | 154 | 0 |
| 2 | 77 | 0 |
| 2 | 38 | 1 |
| 2 | 19 | 0 |
| 2 | 9 | 1 |
| 2 | 4 | 1 |
| 2 | 2 | 0 |
| | 1 | 0 |

$(1234)_{10} = 10110\,10010$

0.125 =

$0.125 \times 2 = 0.250$ → 0

$0.250 \times 2 = 0.500$ → 0

$0.500 \times 2 = 1.000$ → 1

$(0.125)_{10} = (0.001)_2$

Hence $(1234.125)_{10} = (10110\,10010.001)_2$

③ Convert 85.125 to IEEE 754 floating point binary format (Single precision, i.e. 32 bit) (20 points)

$(85)_{10} =$

| | | |
|---|---|---|
| 2 | 85 | |
| 2 | 42 | 1 |
| 2 | 21 | 0 |
| 2 | 10 | 1 |
| 2 | 5 | 0 |
| 2 | 2 | 1 |
| | 1 | 0 |

$= (1010101)_2$

$(0.125)_{10} = (0.001)_2$

Sign = 0

$85.125 = 1010101.001$

$= 1.01010101001 \times 2^6$

Biased Exponent = 127 + 6 = 133

133 = 10000101

Normalized Mantissa (23 bits)

= 01010100100000000000000

Hence

85.125 = 0 (1 bit) 10000101 (8 bits) 01010100100000000000000 (23 bits)