Classwork 03 CPE221 Computer Organization

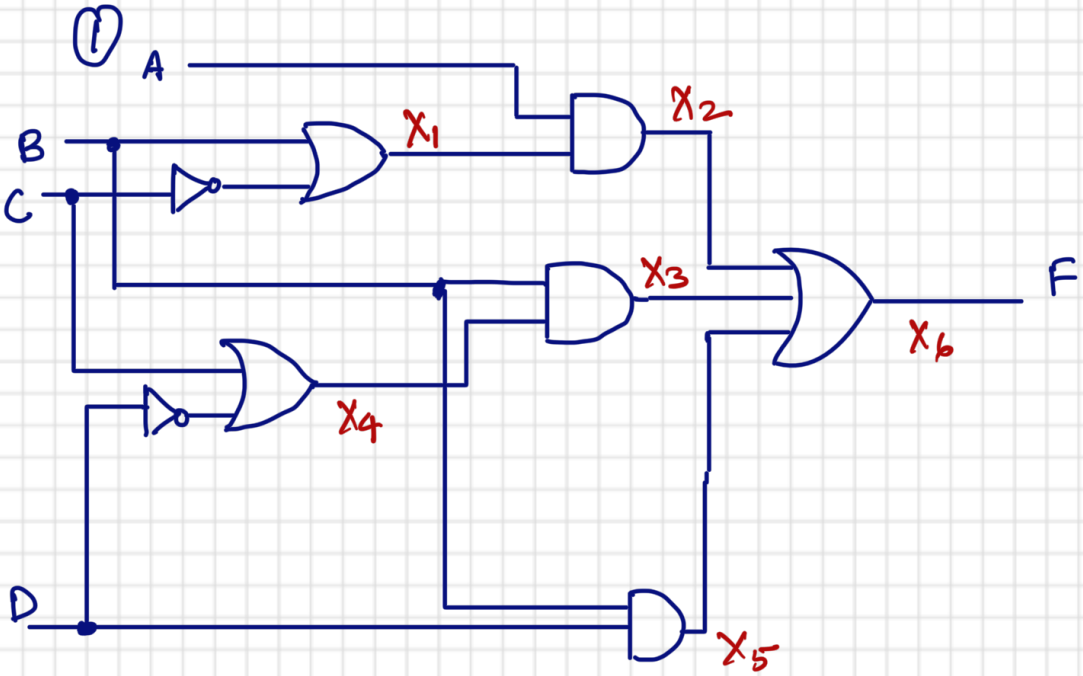
Instructor: Rahul Bhadani

Spring 2025, UAH

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

$(1234)_{10} = 10011010010$

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 $(1234.125)_{10} = (10011010010.001)_2$

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)