

تنظيم الحاسوب وتصميمه

SECOND

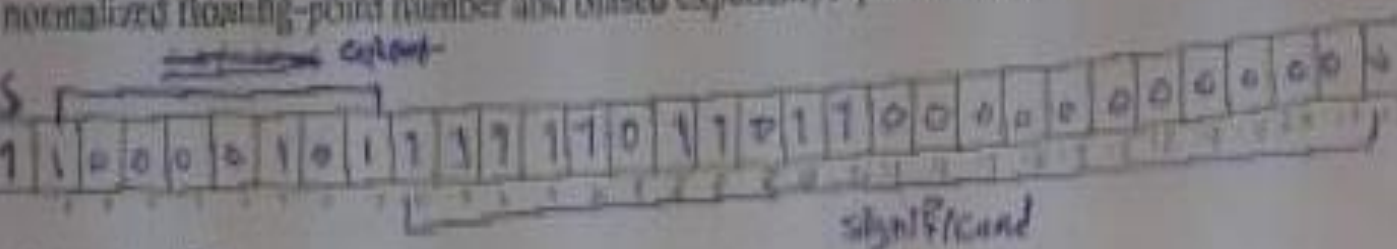
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هندسة الحاسوب والشبكات - البولي تكنك

Student Name: In Arabic

Q1) Convert the number $(-111110.11011)_{10}$ into IEEE 754 FP (32-bit single precision normalized floating-point number and biased exponent) representation.



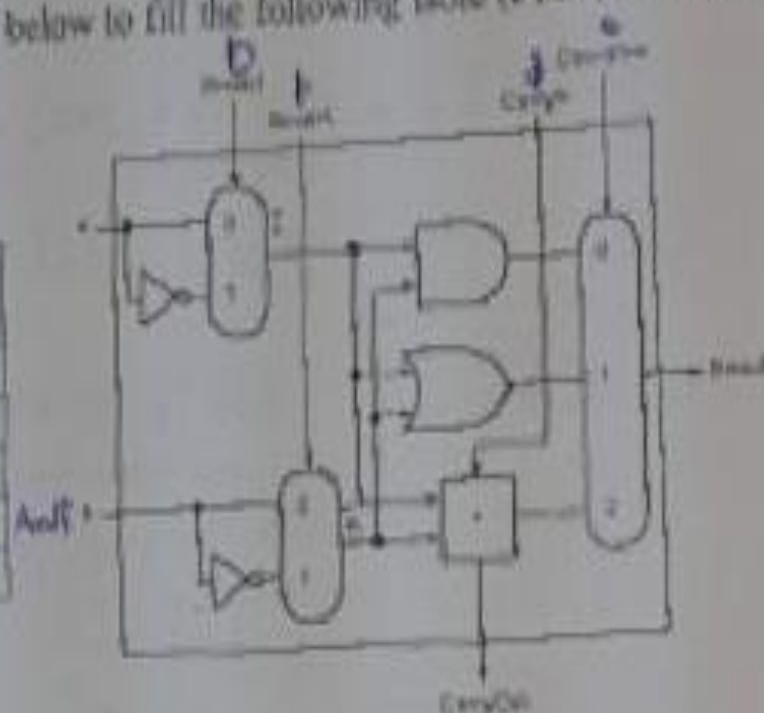
$$127 + 6 = 133$$

$$-1.1111011011 \times 2^6$$

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Q2) Please refer to the 1-bit ALU figure below to fill the following table (I have filled the first entry as an example):

ALU control (Arithmetic Binary (+) operation)	Operation
0000	AND
0001	OR
0010	Add
1100	And?
0110	Sub



2-5 B
(100)

Q3) Consider a machine having a 100 MHz clock and three instruction types with following parameters. Now suppose that two different compilers generate code for the same program. The instruction count for each is given as follows:

IC in millions	Code from compiler 1	Code from compiler 2
Control	3	10
ALU	2	1
Data Transfer	2	1

Instruction Type	CPI
Control	2
ALU	3
Data Transfer	4

Compute the average CPI

~~CPI is better~~

$$CPI_1 = \frac{(2 \times 5) + (3 \times 2) + (4 \times 2)}{9} = \frac{24}{9} = 2.66$$

$$CPI_2 = \frac{(2 \times 10) + (3 \times 1) + (4 \times 1)}{12} = \frac{27}{12} = 2.25$$

~~CPI is better~~

~~Compiler 2 is faster than Compiler 1~~

$$CPU \text{ execution time} = \frac{\sum CPI \times CI}{\text{clock rate}} = \frac{24}{100 \times 10^6}$$

$$CPU \text{ time } \textcircled{1} = \frac{24}{100 \times 10^6} = 0.24 \times 10^{-6}$$

$$CPU \text{ time } \textcircled{2} = \frac{27}{100 \times 10^6} = 0.27 \times 10^{-6}$$

1 is faster than 2

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Using CMOS implement the following function: $F = (A+B+C) + D$ (4 marks)

Ques: Design

$$F = (A+B+C) + D$$

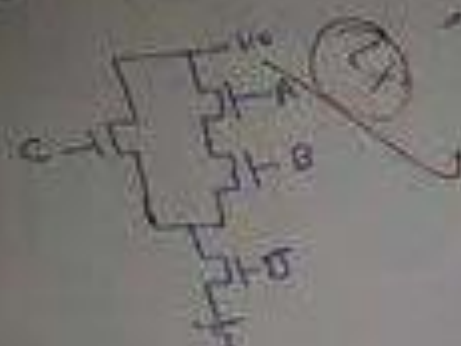
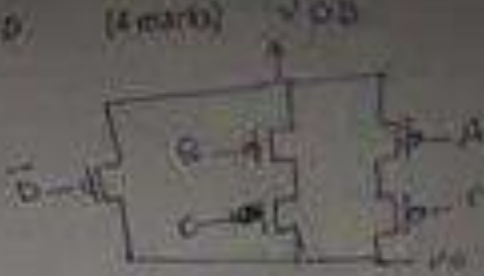
$$= (A+B+C) \cdot \bar{D}$$

$$F = (A+B+C) + D$$

$$F = (A+B+C) + D$$

$$F = (A+B+C) + D$$

$$= A\bar{C} + \bar{A}C + D$$

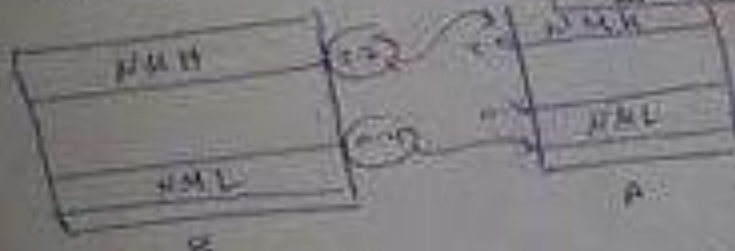


is input is connected to output

(100% mark)

The below table shows the specifications for two logic families, logic family A is driven by logic family B. Discuss if it is possible to drive Logic family A from Logic Family B and what is the fanout.

Parameter	Logic family A	Logic family B
$V_{DD}(\text{min})$	2.0	2.0
$V_{DD}(\text{max})$	0.8	0.8
$V_{OH}(\text{min})$	4.9	2.7
$V_{OL}(\text{max})$	0.1	0.4
$I_L(\text{max})(\mu\text{A})$	1	20
$I_L(\text{max})(\mu\text{A})$	-1	-100
$I_{OH}(\text{max})(\text{mA})$	-4	-0.4
$I_{OL}(\text{max})(\text{mA})$	4	4



$$\text{Fanout} = \frac{I_{OH}}{I_{LH}}$$

$$= \frac{4.9}{0.1} = 49$$

$$\text{Fanout} = \frac{I_{OL}}{I_{LH}} = \frac{4}{0.1} = 40$$

$V_{OH} = 4.9 < V_{OH}(\text{min}) A = 2.0$
 $V_{OL} = 0.1 < V_{OL}(\text{max}) A = 0.4$
 No problem.
 $V_{OH} = 4.9 > V_{OH}(\text{min}) A = 2.0$
 No problem.



$$\text{fanout} = \min(N_L, N_H)$$

$$= \min(49, 40)$$

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100% mark



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فريق



يتمنى لكم التوفيق دوما

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