Home work - 1

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Part - 1

1. Convert the hexadecimal number $64CD_{16}$ to binary, to octal and decimal.

$64CD_{16} = (0110)\ (0100)\ (1100)\ (1101) = 0110010011001101_2$ binary

$(6)\ (4)\ (C=12)\ (D=13)$

$0110010011001101_2 = (110)\ (010)\ (011)\ (001)\ (101)_2 = 62315_8$ octal

$(6)\ (2)\ (3)\ (1)\ (5)$

$64CD_{16} = 6\times16^3 + 4\times16^2 + 12\times16^1 + 13\times16^0{}_{10} = 25805_{10}$ decimal

2. Convert the decimal number 431 to binary, hexadecimal and octal.

$431 \mid 2$ → $215 \mid 2$ → $107 \mid 2$ → $53 \mid 2$ → $26 \mid 2$ → $13 \mid 2$ → $6 \mid 2$ → $3 \mid 2$ → 1

remainders: 1, 1, 1, 0, 1, 0, 1, 1

$= (110101111)_2$ binary

$(110)\ (101)\ (111) = (657)_8$ octal

$(6)\ (5)\ (7)$

$(0001)\ (1010)\ (1111) = (1AF)_{16}$ hexadecimal

$(1)\ (A)\ (F)$

3. Express the following numbers in decimal:
   a. $(10110.0101)_2$
   b. $(16.5)_{16}$
   c. $(26.24)_8$
   d. $(DADA.B)_{16}$
   e. $(1010.1101)_2$

a) $1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 0\times2^0 + 0\times2^{-1} + 1\times2^{-2} + 0\times2^{-3} + 1\times2^{-4} = 22.3125_{10}$

$1\times2^{-2} = 0.25$, $1\times2^{-4} = 0.0625$

b) $(16.5)_{16} = (1\times16^1 + 6\times16^0)_{10} . (5\times16^{-1})_{10} = 22 + \frac{5}{16} = 22.3125_{10}$

c) $(26.24)_8 = (2\times8^1 + 6\times8^0)_{10} . (2\times8^{-1} + 4\times8^{-2})_{10} = 22 + \frac{2}{8} + \frac{4}{64} = 22.3125_{10}$

d) $(DADA.B)_{16} = (13\times16^3 + 10\times16^2 + 13\times16^1 + 10\times16^0)_{10} . (11\times16^{-1})_{10} = 56026.6875_{10}$

e) $(1010.1101)_2 = 10 + \frac{1}{2} + \frac{1}{4} + \frac{1}{16} = 10.8125_{10}$

4. Convert the following binary numbers to hexadecimal and to decimal:
   a. 1.10010
   b. 110.010. Explain why the decimal answer in (b) is 4 times that in (a).

a) $(0001.1001)_2 = (1.9)_{16} = (1.5625)_{10}$

$1 + \frac{1}{2} + \frac{1}{16}$

b) $(0110.0100)_2 = (6.4)_{16} = (6.25)_{10}$

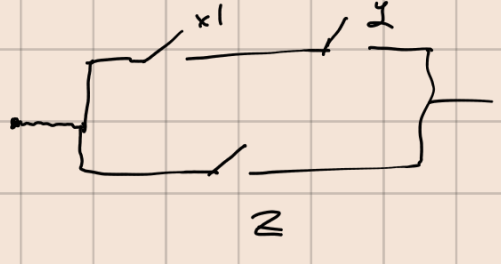
$6 + \frac{1}{4}$

6.25 is 4 times that 1.5625 because:
if we mutiply 1.1001 by $4 = 2^2$ moves the numbers to the left by two which is 110.01 (b). (The dot is not moving)

5. Draw truth table of the Boolean function f(x,y,z)=x'y+z.

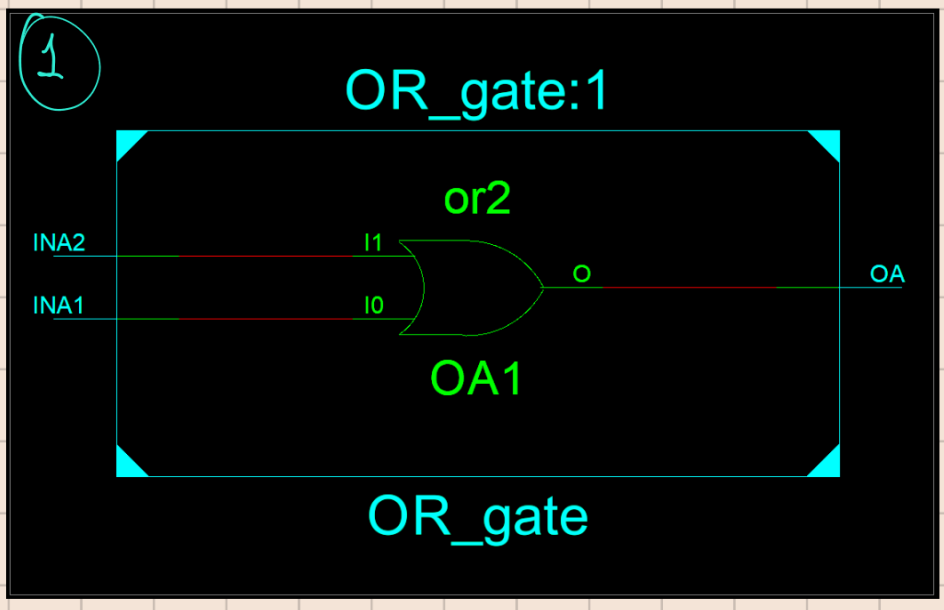
$X'y + Z = f(x,y,z)$

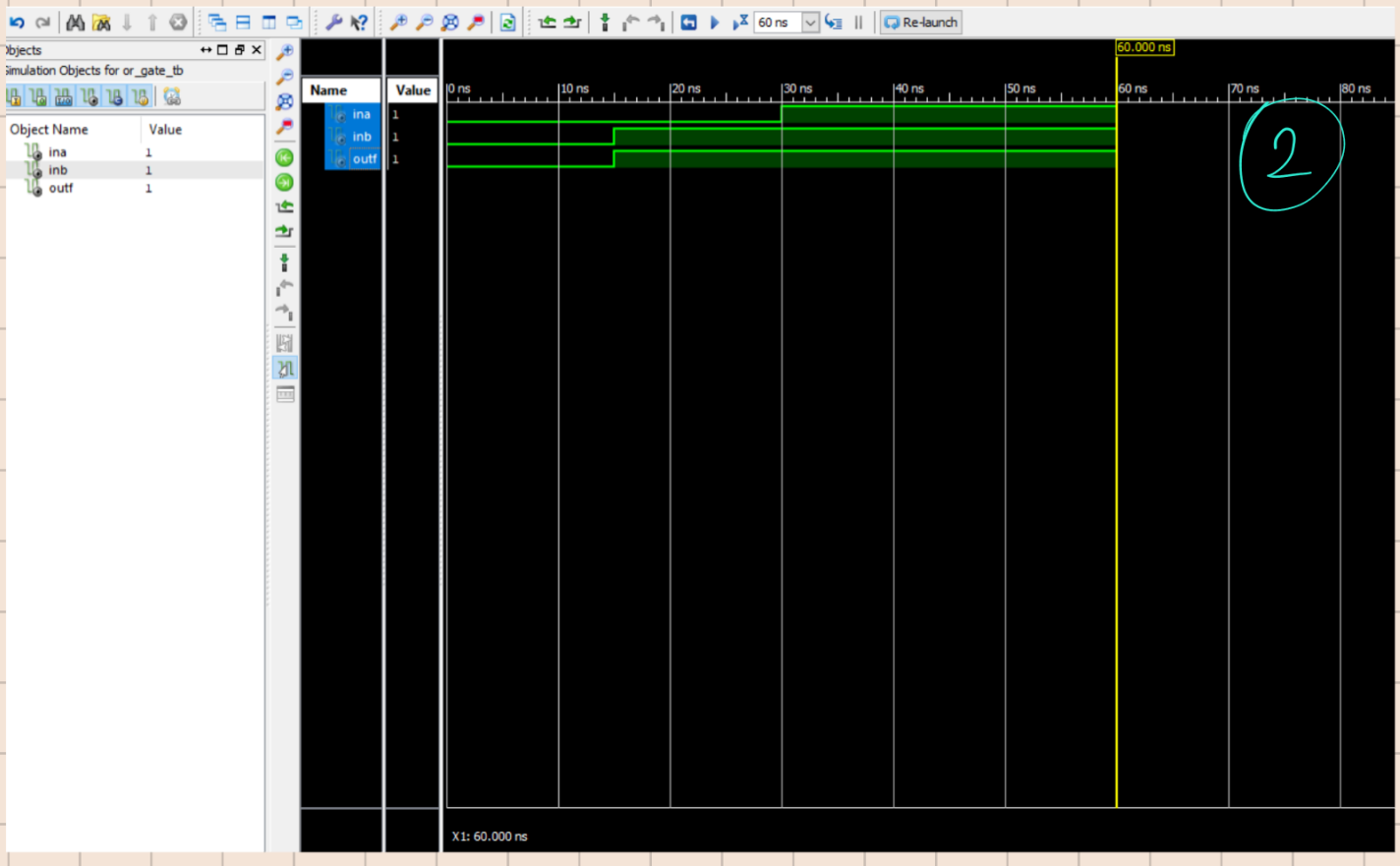
X NOT AND y OR z



x	y	z	f
1	0	0	0
1	1	0	0
1	0	1	1
1	1	1	1
0	0	0	0
0	1	0	1
0	0	1	1
0	1	1	1

Part - 2


1
OR_gate:1
or2
INA2
I1
INA1
I0
O
OA
OA1
OR_gate


Re-launch
60 ns
Objects
Simulation Objects for or_gate_tb
Object Name
Value
ina
inb
outf
Name
Value
0 ns
10 ns
20 ns
30 ns
40 ns
50 ns
60 ns
70 ns
80 ns
60.000 ns
X1: 60.000 ns
2

Report:

For the first part, we simply define inputs and outputs in the syntax. For this homework the source has already been given by lecturer, so all we need is to add it into our project. After that to view schematic we run "View RTL Schematic" under synthesize tab at the "Implementation" view option.

For the second part, we need to switch the view option to "Simulation" and run "Simulate Behavioral Model" function on process window. After a couple of zooming adjustments we can see the graph in the 2nd image. To understand the OR function I double clicked on one of the objectives. As it can be seen in the syntax we are basically define the inputs as zeros at the first 15 ns. There for the output of the OR gate is also zero. For the second test we define input B "1" and input A "0" which makes output 1 between 15 - 30 ns. For the last part we define all the two inputs "1" which gives "1" for OR function again. So the graph of output does not change.