1.

a)

$$Out = A'BC + AB'C + ABC$$

b)

C \ AB	00	01	11	10
0	0	0	0	0
1	0	1	1	1

Based on this K-map, we can simplify the result.

$$Out = BC + AC$$

c)

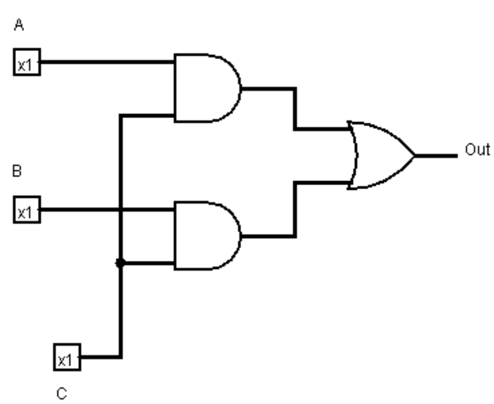

Figure 1: gate-level logic circuit

2.

$$Y = (A+B)' + C$$
$$Z = C' \oplus BD$$

3.

a)

$$\begin{aligned}25 &= 16 + 8 + 1\\ 25 &= 16 + 9\end{aligned}$$

From the above equation, we can know that,

$$(25)_{10} = (00011001)_2 = (0x19)_{16}$$

b)

$$\begin{aligned}62 &= 32 + 16 + 8 + 4 + 2\\ (62)_{10} &= (00111110)_2\end{aligned}$$

So we know that,

$$(-62)_{10} = (11000010)_2 = (0xC2)_{16}$$

c)

$$127 = 64 + 32 + 16 + 8 + 4 + 2 + 1$$

So we know that,

$$(127)_{10} = (01111111)_2 = (0x7F)_{16}$$

4.

a)

$$\begin{aligned}(6AFA)_{16} &= 6 * 16^3 + 10 * 16^2 + 15 * 16^1 + 10 * 16^0\\ &= (27386)_{10}\end{aligned}$$

b)

$$\begin{aligned}(00100001)_2 &= 1 * 2^5 + 1 * 2^0\\ &= (33)_{10}\end{aligned}$$

c)

$$\begin{aligned}(10111001)_2 &= -1 * 2^7 + 1 * 2^5 + 1 * 2^4 + 1 * 2^3 + 1 * 2^0 \\ &= (-71)_{10}\end{aligned}$$

5.

a)

$$(63.25)_{10} = (111111.01)_2 \tag{1}$$

Then we can do normalization,

$$(111111.01)_2 = 1.1111101 * 2^5 \tag{2}$$

Sign is "+", which = 0.
Exponent = 5 + 127 = 132 = 10000100.
Mantissa = 1.111 1101 0000 0000 0000 0000.
So the final result is,

$$0|10000100|11111010000000000000000$$

Hex = 0x427D0000

b)

For Hex = 0xC1300000, we first change it to binary.

$$1|10000010|01100000000000000000000$$

Sign = 1, which is negative "-".
Exponent = 10000010 = 130 = 3 + 127.
Mantissa = 1.01100000000000000000000.
So the final result is,

$$-1.011 * 2^3 = (-1011)_2 = (-11)_{10}$$

6.

a)

$$00110110 + 01000101 = 01111011$$
$$54 + 69 = 123$$

b)

$$01110101 + 11011110 = 01010011$$
$$117 - 34 = 83$$

c)

$$10011101 + 10000001 = 00011110$$
$$-99 - 127 \neq 30$$

So it has overflow.

0.1 d)

$$00101101 * 00000101 = 11100001$$
$$45 * 5 \neq -31$$

So it has overflow.

7.

a)

z \ xy	00	01	11	10
0	1	0	0	1
1	1	1	0	1

Based on this K-map, we can simplify the result.

$$F(x, y, z) = y^{'} + x^{'}z$$

b)

z \ xy	00	01	11	10
0	0	0	0	0
1	1	1	1	1

Based on this K-map, we can simplify the result.

$$F(x, y, z) = z$$

c)

CD \ AB	00	01	11	10
00	1	0	1	1
01	0	1	1	0
11	0	1	0	0
10	1	0	0	1

Based on this K-map, we can simplify the result.

$$F(A, B, C, D) = B^{'}D^{'} + ABC^{'} + A^{'}BD$$

d)

yz \ wx	00	01	11	10
00	0	1	1	0
01	1	1	1	1
11	1	0	0	1
10	0	0	0	1

Based on this K-map, we can simplify the result.

$$F(w, x, y, z) = xy^{'} + x^{'}z + wx^{'}yz^{'}$$