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Assignment on:3,4 and 5 bits X-OR Logic Gate Design and uses of Carry Bit in Digital System.

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Question – 1 : Find the output of X-OR logic gate for 3, 4, 5 bits input.

Ans : An XOR gate (pronounced as Exclusive OR gate) is a gi digital logic gate that give true output when the number of true inputs is odd. Otherwise XOR gate gives false (0) output.

The possible input and output are given below by a truth table for 3-inputs :

A	B	C	X
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

Let three inputs are A, B, C and the output is X

these 1 row has odd number of 1's. thats way their output are '1'

Similarly, for 4-inputs :

0000 — 0
0001 — 1
0010 — 1
0011 — 0
0100 — 1
0101 — 0
0110 — 0
0111 — 1
1000 — 1
1001 — 0
1010 — 0
1011 — 1
1100 — 0
1101 — 1
1110 — 1
1111 — 0

for five inputs,

00000 — 0
00001 — 1
00010 — 1
00011 — 0
00100 — 1
00101 — 0
00110 — 0
00111 — 1
01000 — 1
01001 — 0
01010 — 0
01011 — 1
01100 — 0
01101 — 1
01110 — 1
01111 — 0

10000 — 1
10001 — 0
10010 — 0
10011 — 1
10100 — 0
10101 — 1
10110 — 1
10111 — 0
11000 — 0
11001 — 1
11010 — 1
11011 — 0
11100 — 1
11101 — 0
11110 — 0
11111 — 1

Question – 2 : Why we use carry bit for designing a system?

Ans : In digital system, carry bit is widely used specially on arithmatic & logical operation. Arithmatic operations such as addition, substraction, carray bit is used in some case. There are some reason why we use carry bit :

1. Handling overflow :

In binary arithmatic operation, addition operation is performed by adding corresponding bits by their position. There can have four cases such as –

$0+0 = 0$
$0+1 = 1$
$1+0 = 1$
$1+1 = 10$

When '1+1' operation is performed, on sum position, 0 will be put and MSB '1' will be added with next position of those two numbers, Here carry bit helps to carry this excess '1'.

2. Multibit Operation : When Performing addition or Subtraction on multibit binary numbers we need to propagate any carry generated during the operation to the next higher bit position. The carry bit gets as a signaling mechanism to indicate whether a carry occurred in the current bit position and this information is used in the next bit positions operation.

3. Accurate Arithmatic : The carry bit ensures that binary addition and subtraction operation is accurate. It ensures that each bit is correctly added or subtracted while taking into account any carry from the previous bit position.

4. Cascading operation : In that digital system, arithmetic operations often involve cascading adder or subtractor to handle langer numbers. The carry bit ensures that these cascading operation works correctly by carrying over from one stage to the next.

5. Flags and controls :

In microprocessor & microcontroller, the carry flag is often used as a conditional branch instruction. This allows the processor discision based on whether a carry occured during an arithmatic operation, enabling conditional branching in program execution.

6. Error Detection :

The carry bit can also be used for error detection in digital circuits. For example, it can be used in parity checking for detecting single bit errors in data transmission.

overall, the carry bit is a fundamental concept in digital design that ensures the accurate and reliable operation of digital system specially when dealing with binary arithmatic and multibit data.