Paper 7, TDC Part-3 Chapter-3, Number Systems and Codes **Electronics** Lecture – Binary Addition **By: Mayank Mausam Assistant Professor (Guest Faculty) Department of Electronics** L.S. College, BRA Bihar University, **Muzaffarpur, Bihar**

• **Binary Arithmetic : -**

We perform different types of arithmetic calculation using digital systems like calculator, computer etc. We are also familiar with the things that the data we provide to digital system i.e. inputs, are first converted to binary number then it is handle by the digital system for necessary operation.

Arithmetic operation such as addition, subtraction, multiplication and division is performed to binary numbers in digital systems.

• <u>Binary Addition : -</u>

As any number in binary number system is expressed as series combination of 0 & 1, in similar manner the result of addition of two and more numbers in binary system is a series combination of 0 & 1. Therefore the four basic rules for adding 0 & 1 are: -

- 0 + 0 = 0 ----- Sum part is 0 and carry part is 0.
- 0 + 1 = 1 ----- Sum part is 1 and carry part is 0.
- 1 + 0 = 1 ----- Sum part is 1 and carry part is 0.
- 1 + 1 = 10 ----- Sum part is 0 and carry part is 1.

In the fourth rule we se that addition of two 1's results in binary two $(10)_2$. When binary numbers are added, the last condition results a sum of '0' in a given column and generate a carry of 1 over to the next column to the left. Let's see few examples.

Examples- Add the following binary numbers –

- a) 11001 and 1000
- b) 11100 and 11010
- c) 10110101 and 11100011

bollow numbers'binary [1001 and 00 from previow Solutioni- (a) Sum Carry -00 o gene 0 04 0 Ligher no Sum Ansh 000 2 this, using 60 25 10 33 100001 10 $1_{2} + 1_{2} = (10)_{2} = (2)_{10}$ $1_{2} + 1_{2} + 1_{2} = (10)_{2} + (1)_{2}$ 11), -(3), 1 REDMINOTE 8 PROI V \bigcirc

So answer 15 (110110)2 this using decimal Agais system 10 20 211 Car 0011000 9 aver this also using decima Jem Z 110 408 T

Example(2) Add the binary numbers as given (i) (11011), (10100), & (10001)2 $\begin{array}{c} (ii) (110110)_{2}, (100$11)_{2}, (001$01)_{2} \\ (100$101)_{2} \end{array}$ Solo- We can add 2 or more benary numbers in two ways. Int Method :staro numbers l the third number stained by the adding the 1st two numb s Again add the mext number to a previous sum obtained and so on. Mathod :-> all given numbers at a time. Addition of numbers given above in (i) by E Sum of two

40 the number A Now adding ries con ner x (i)oumbers given in addi oh + secor hoong 0 150 -1 0 mbo ADCA

4 Sum 0 Sam after adding 0 0 0 ROAL ta can ven ey. t. X dalibion oumbers given (if Cr in secon 0 d 00 20 17 17 O

From the examples it can observed that,

i) If the number of 1's to be added in a column is even then the sum bit is '0', and if the number of 1's to be added in a column is odd then the sum bit is '0'.

Thank You