**CPTR 5400\_Srinath Kallu\_900741822**

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1. Perform the following base conversions using subtraction or division-remainder: d) 440110 =(6030)9

5. Perform the following base conversions. c) 32367 =(1154)10

8. Convert the following decimal fractions to binary with a maximum of six places to the right of the binary point:

d) 84.874023=(10101000.110111)

11. Convert the following binary fractions to decimal: b) 111111.10011=(63.59375)10

1. Represent the following decimal numbers in binary using 8-bit signed magnitude, one's complement, two's complement, and excess-127 representation:
   1. 77

Ans: One’s complement representation: 00110010

Two’s complement representation: 00110011

Excess-127 representation: 11001100

1. What decimal value does the 8-bit binary number 10011110 have if:
   1. it is interpreted as an unsigned number?

Ans: 158

* 1. it is on a computer using signed-magnitude representation?

Ans: -30

* 1. it is on a computer using one’s complement representation?

Ans: -97

* 1. it is on a computer using two’s complement representation?

Ans: -98

* 1. it is on a computer using excess-127 representation?

Ans: 285

34. Subtract the following signed binary numbers as shown using 2's complement arithmetic. c) 01101111

– 00010001

Ans; 01011110

37. Perform the following binary multiplications, assuming unsigned integers: a) 1011

× 101

Ans: 110111

40. Use the double-dabble method to convert 102123 directly to decimal. (Hint: you have to change the multiplier.)

Ans: The decimal number for 102123 is 10410

43. Perform the following binary multiplications using Booth’s algorithm, assuming signed two’s complement integers:

b) 0011

× 1011

* 0011

0000

+0011

-0011

0100001

45. If the floating-point number representation on a certain system has a sign bit, a 3-bit exponent and a 4-bit significand:

1. What is the largest positive and the smallest positive number that can be stored on this system if the storage is normalized? (Assume no bits are implied, there is no biasing, exponents use two's complement notation, and exponents of all zeros and all ones are allowed.

Ans: Largest positive number is 0.11112\*23=111.12=7.5

Small positive number is 0.12\*2-4=0.000012=1/32=0.03125

1. What bias should be used in the exponent if we prefer all exponents to be non-negative? Why would you choose this bias?

Ans: For all non-negative exponents , we would need a bias of 4.

49. Why do we usually store floating-point numbers in normalized form? What is the advantage of using a bias as opposed to adding a sign bit to the exponent?

Ans: All the numbers can’t be represented in digital computers , floating point numbers must ne normalized , which means the leftmost bit of the significant must always be 1. This is called normalization. The unsigned value represents the value 0 , whereas all zeros in the bit pattern represents –M . A decimal integer is mapped to an unsigned binary integer, but interpreted as positive and negative depends on where it falls in the range. The advantage of bias of is it can represent the large range values and calculations are done faster.

51. Show how each of the following floating point values would be stored using IEEE-754 single precision (be sure to indicate the sign bit, the exponent, and the significant fields):

a) 12.5=0 10011 11001000

58. Decode the following ASCII message, assuming 7-bit ASCII characters and no parity: 1001010 –J

1001111 –O

1001000-H

1001110 -N

0100000-SPACE

1000100 –D

1001111-O

1000101-E

61. Suppose we are given the following subset of codeword’s, created for a 7-bit memory word with one parity bit: 11100110, 00001000, 10101011, and 11111110. Does this code use even or odd parity? Explain.

Ans: For the given code word there are odd number of bits hence we need odd parity

63. Compute the Hamming distance of the following code: 0011010010111100

8

0000011110001111 4

4 4

0010010110101101 4

8

0001011010011110

1. Suppose we want an error-correcting code that will allow all single-bit errors to be corrected for memory words of length 10.
   1. How many parity bits are necessary?

Ans: k+r+1 < 2r

k is the length of code

R is the number of parity bits r=1,2,3,…..

K=10

r=1,

10+1+1< 2 false

r=2,

10+2+1< 4 false

r=3,

10+3+1< 8 false

r=4,

10+4+1< 16 true

The number of parity bits used are 4

* 1. Assuming we are using the Hamming algorithm presented in this chapter to design our error-correcting code, find the code word to represent the 10-bit information word: 1001100110.

Ans: The code word is 101101.

The parity bits are at position 8,4,2,1, therefore by removing the bits at that position we get the code word.

68. Suppose we are working with an error-correcting code that will allow all single-bit errors to be corrected for memory words of length 7. We have already calculated that we need 4 check bits, and the length of all code words will be 11. Code words are created according to the Hamming Algorithm presented in the text. We now receive the following code word:

1 0 1 0 1 0 1 1 1 1 0

Assuming even parity, is this a legal code word? If not, according to our error-correcting code, where is the error?

Ans:

11 10 9 8 7 6 5 4 3 2 1

1 0 1 0 1 0 1 1 1 1 0

By checking bit 1 the positions 3,5,7,9 and 11 we assign 1since we have odd number of 1’s.

By checking bit 2 the positions 5, 6 and 7 we assign 0 since we have even number of 1’s.

By checking bit 3 the positions 9, 10 and 1we assign 0 since we have even number of 1’s.

The value 1 0 0 i.e. the 4th position has the error. By changing the bit 4, to 0 if their value is 1 or to 0 if it is 1.

Therefore,

11 10 9 8 7 6 5 4 3 2 1

1 0 1 0 1 0 1 0 1 1 0

76. Find the quotients and remainders for the following division problems modulo 2. d) 1111010102 ÷ 100112

10011)111101010(111001

10011

011011

10011

010000

10011

0111

78. Using the CRC polynomial 1101, compute the CRC code word for the information word, 01001101. Check the division performed at the receiver.

1101)01001101(01111

01101

001001

1101

01000

1101

0000

Hence CRC polynomial for the information word , 01001101 is 0110 therefore the correct information word is 01001011