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Course: DLD

Assignment 1

Question 1

a) 128 K bits

$128 \times 2^{10} = 131072$ bits.

b) 32 M bits

$32 \times 2^{20} = 33554432$ bits

c) 8 G bits

$8 \times 2^{30} = 8589934592$ bits.

Question 2

a) 64 K bits = x M bits.

$$x = \frac{64 \times 2^{10}}{2^{20}}$$

$$x = 0.0625$$

b) 9 G bits = x M bits.

$$x = \frac{9 \times 2^{30}}{2^{10}}$$

$$x = 9216$$

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Q3 a) Question 3

a) $(369.3125)_{10}$

Binary

2	369	1
2	184	0
2	92	0
2	46	0
2	23	1
2	11	1
2	5	1
2	2	0
2	1	1
	0	0

$0.3125 \times 2 = 0.625$

$0.625 \times 2 = 1.25$

$0.25 \times 2 = 0.5$

$0.5 \times 2 = 1.0$

$(101110001.0101)_2$

Octal.

8	369	1
8	46	6
8	5	5
	0	

$0.3125 \times 8 = 2.5$

$0.5 \times 8 = 4.0$

$(561.24)_8$

Hexadecimal

16	369	1
16	23	7
16	1	1
	0	

$0.3125 \times 16 = 5.0$

$(171.5)_{16}$

b) $(10111101.101)_2$

octal

010 111 101 . 101

$(275.5)_8$

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Decimal.

7 6 5 4 3 2 1 0 -1 -2 -3

10111101.101

~~(1 x 2^7) + (0 x 2^6~~

$(1\times2^7)+(1\times2^5)+(1\times2^4)+(1\times2^3)+(1\times2^2)+(1\times2^0)$

$+(1\times2^{-1})+(1\times2^{-3})$

$= 128+32+16+8+4+1+\frac{1}{2}+\frac{1}{8}$

$= (189.625)_{10}$

Hexadecimal

1011 1101. 1010

B D A

$(BD.A)_{16}$

(C) $(326.5)_8$

Binary

3 2 6 . 5

011 010 110 101

$(011010110.101)_2$

Decimal

~~162~~ $3^{2}2^{1}6^{0}.5^{-1}$

$(3\times8^2)+(2\times8^1)+(6\times8^0)+(5\times8^{-1})$

$= 192+16+6\frac{5}{8}$

$(214.625)_{10}$

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Hexadecimal

$(326.5)_8$

→ to Binary

011 010 110 . 1010
D A A

to Hexadecimal

$(1D6.A)_{16}$

d) $(F3C7.A)_{16}$

Binary

$(1111\ 0011\ 1100\ 011.\ 1010)_2$

Decimal.

$F^{3}\ 3^{2}\ C^{1}\ 7^{0}\ .\ A^{-1}$

$(15\times16^3)+(3\times16^2)+(12\times16^1)+(7\times16^0)+(10\times16^{-1})$

$= 61440 + 768 + 192 + 7 + \frac{10}{16}$

$= (62407.625)_{10}$

Octal

to Binary.

$(1111\ 0011\ 1100\ 0111.\ 1010)_2$

to octal.

001 111 001 111 000 111 . 101

$(171707.5)_8$

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Question 4

a) 7562.45 to octal

8 | 7562	2	
8 | 945	1	
8 | 118	6	
8 | 14	6	
8 | 1	1	
0		

$0.45 \times 8 = 3.6$

$0.6 \times 8 = 4.8$

$0.8 \times 8 = 6.4$

$0.4 \times 8 = 3.2$

$(16612.3463\ldots)_8$

b) 1938.257

16 | 1938	2	
16 | 121	9	
16 | 7	7	

$0.257 \times 16 = 4.112$

$0.112 \times 16 = 1.792$

$0.792 \times 16 = 12.672$

$(792.41C\ldots)_{16}$

c) 175.175 to binary

2 | 175	1	
2 | 87	1	
2 | 43	1	
2 | 21	1	
2 | 10	0	
2 | 5	1	
2 | 2	0	
2 | 1	1	
0		

$0.175 \times 2 = 0.35$

$0.35 \times 2 = 0.7$

$0.7 \times 2 = 1.4$

$0.4 \times 2 = 0.8$

$(10101111.0010\ldots)_2$

d) 25.305 to base 8

8 | 25	1	
8 | 3	3	

$0.305 \times 8 = 2.44$

$0.44 \times 8 = 3.52$

$0.52 \times 8 = 4.160$

$(31.235\ldots)_8$

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Question 5

(a) $(BEE)_r = (2699)_{10}$

$r = 16$

(b) $(365)_r = (194)_{10}$

a) $(BEE)_r = (2699)_{10}$

$(B \times r^2) + (E \times r^1) + (E \times r^0) = 2699$

$11r^2 + 14r + 14 = 2699$

$11r^2 + 14r - 2685 = 0$

(a) $(BEE)_r = (2699)_{10}$

$r = 15$

b) $(365)_r = (194)_{10}$

$r = 7$

Question 6

a) 6th bit

e.g B = 0(0)000010

b = 0(1)000010

b) 1001000 1100101 1101100 1101100 1101111 0100110

H e l l o .

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Question 7

a) Decimal Number : 6

7-bit binary : 0000110

8-bit binary with parity bit: 10000110

Hexadecimal : $(86)_{16}$

b) Decimal number : 15

7-bit binary : 0001111

8-bit binary with parity : 10001111

Hexadecimal : $(8F)_{16}$

c) Decimal Number : 24

7-bit binary : 0011000

8-bit binary with parity : 10011000

Hexadecimal : $(98)_{16}$

Question 8

a) 255 → Binary

$(11111111)_2$

b) BCD

0010 0101 0101

c) ASCII

00110010 00110101 00110101

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d) ASCII with odd parity

10110010 10110101 10110101

Question 9

a) 56 + 227

56: 111000

226: 11100011

$$\begin{array}{r} 00111000 \\ +\ 11100011 \\ \hline (100011011)_2 \end{array} = 282$$

b) 246 + 25

246 + 25

246: 11110110

25: + 11001

271 100001111

c) 2110 + 284

2110: 100000111110

284: + 000100011100

2394 100101011010

Question 10

a) $\begin{array}{r} 01110000 \\ +\ 10101111 \\ \hline (10001\ 1111)_2 \end{array}$

b) $\begin{array}{r} 11011001 \\ +\ 11100111 \\ \hline (111000000)_2 \end{array}$

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c) 01100101 − 11101000

A = 11101000

A' = 00011000

$$\begin{array}{r} 01100101 \\ +\ 00011000 \\ \hline 01111101 \end{array}$$

Question 11

$\bar{A}(A+B) + (B+A.A)(A+\bar{B}) = (A+B)$

$= \bar{A}(A+B) + (A+B)(A+\bar{B})$ ∴ $(A.A = A)$

$= \bar{A}(A+B) + (A+B.\bar{B})$ ∴ (Distributive law)

$= \bar{A}(A+B) + (A+0)$ ∴ $(B.\bar{B} = 0)$

$= \bar{A}A + \bar{A}B + A$ ∴ $(\bar{A}A = 0)$

$= A + \bar{A}B + 0$ ∴ (Distributive law.

$= (A+\bar{A})(A+B)$ ∴ $(A+\bar{A} = 1)$

$= (1)(A+B)$

$= (A+B)$

Hence proven.

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