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Subject: Digital Logic design

Assignment NO : 01

1.2

What is the exact number of bytes in system that contain.

a) 32k bytes

$$32k = 32 \times 1024 = 32768 \text{ bytes.}$$

b) 64M bytes

$$64M = 64 \times 1024 \times 1024 = 67108864 \text{ bytes.}$$

c) 6.4G bytes

$$64G = 64 \times 1024 \times 1024 \times 1024 = 68719476736 \text{ bytes.}$$

1.3

Convert the given number to decimal.

a) $(4310)_5$

$$= 4 \times 5^3 + 3 \times 5^2 \times 1 \times 5^1 \times 0 \times 5^0$$

$$= 4 \times 125 + 3 \times 25 + 1 \times 5 + 0$$

$$= 500 + 75 + 5 + 0$$

$$= 580.$$

b) $(198)_{12}$

$$= 1 \times 12^2 + 9 \times 12^1 + 8 \times 12^0$$

$$= 1 \times 144 + 9 \times 12 + 8 \times 12^0$$

$$= 144 + 108 + 8$$

$$= 260.$$

c) $(435)_8$

$= 4 \times 8^2 + 3 \times 8^1 \times 5 \times 8^0$

$= 4 \times 64 + 3 \times 8 + 5 \times 1$

$= 256 + 24 + 5$

$= 285.$

d) $(345)_6$

$= 3 \times 6^2 + 4 \times 6^1 + 5 \times 6^0$

$= 3 \times 36 + 4 \times 6 + 5 \times 1$

$= 108 + 24 + 5$

$= 137.$

1.4

Find largest binary number that can be expressed with 16 bits and its decimal & hexadecimal equivalents.

• Largest 16-bit binary number.

$1111111111111111_2.$

• Decimal equivalent

$2^{16} - 1 = (65535)_{10}$

• Hexadecimal equivalent

$(FFFF)_{16}$

Each 4 bit group represents a hexadecimal digit

$(1111 \quad 1111 \quad 1111 \quad 1111)_2$

$1111 = F$

$1111 = F$

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$1111 = F$

R·W

$= 1 \times 2^3 \times 1 \times 2^2 \times 1 \times 2^1 \times 1 \times 2^0$

$= 8 + 4 + 2 + 1$

$= 15$

$\Rightarrow 15 = F$

(2)

1.7

Convert 64CD to binary, then binary to octal.

Hexadecimal to binary

$(64CD)_{16} =$

$6 = 0110$

$4 = 0100$

$C = 12 = 1100$

$D = 13 = 1101$

$= 0110\,0100\,1100\,1101$.

Binary to octal

$(011\,001\,001\,100\,1101)_2$

$011 = 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 3$

$001 = 0 \times 2^2 \times 0 \times 2^1 + 1 \times 2^0 = 1$

$001 = 1$

$100 = 4$

$110 = 6$

$101 = 5$

$= (311465)_8$.

1.9

Express the following into decimal.

a) $(10110.0101)_2$

$= (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (1 \times 2^1) + (0 \times 2^0) \cdot (0 \times 2^{-1}) + (1 \times 2^{-2}) + (0 \times 2^{-3}) + (1 \times 2^{-4})$

$= 16 + 4 + 2 + 0.25 + 0.0625$

$= (22.3125)_{10}$.

b) $(26.24)_8$

$= (2 \times 8^1) + (6 \times 8^0) \cdot (2 \times 8^{-1}) + (4 \times 8^{-2})$

$= 16 + 6.025 + 0.00625$

$= (22.3125)_{10}$.

c) $(DADA.B)_{16}$

$D = 13, \quad A = 10 \quad B = 11$

$$= (13 \times 16^3) + (10 \times 16^2) + (13 \times 16^1) + (10 \times 16^0) . (11 \times 16^{-1})$$

$$= (13 \times 4096) + (10256) + (13 \times 16) + (10 \times 1) . (11 \times 0.0625).$$

$$= 53248 + 2560 + 208 + 10 + 0.6875.$$

$$= (56026.6875)_{10}.$$

e) $(1010.1101)_2$

$$= (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (0 \times 2^0) . (1 \times 2^{-1}) + (1 \times 2^{-2}) + (0 \times 2^{-3}) +$$
$$(1 \times 2^{-4})$$

$$= 8 + 2 + 0.5 + 0.25 + 0.0625$$

$$= (10.8125)_{10}.$$