Name: Kuewu Pamela
Student ID: 22048845
Course title: DCIT 105
Lecturer's Name: Dr Solomon Mensah

1. Decode the following ASCII code:
[2 marks]
1010011 1110100 1100101 1110110 1100101 0100000 1001010 1101111
1100010 1110011

Answer

1010011- 83- S

1110100- 116- t

1100101- 101- e

1110110- 118- v

1100101- 101- e

0100000- 32 -space

1001010- 74- J

1101111- 111- o

1100010- 98- b

1110011- 115- s

Steve Jobs

2. The state of a 12-bit register is 100010010111. What is its content if it represents
(a) Three decimal digits in BCD?
[1 mark]

(b) Three decimal digits in the excess-3 code?
[1 mark]
(c) Three decimal digits in the 84-2-1 code?
[1 mark]
(d) A binary number?
[1 mark]

<u>Answer</u>

a) Divide the binary into 4-bits beginning from the right = 897
   0111 – 2^0+2^1+2^2 = 7
   1001 – 2^0+2^3 = 9
   1000 – 2^3 = 8

b) Decimal digits in the excess-3 code
   8+3 = 11
   9+3 = 12
   7+3 = 10

c)

Decimal digits	8	4	-2	-1
8	1	0	0	0
9	1	1	1	1
7	1	0	0	1

d) Binary number = 100010010111

3. Add and multiply the following numbers without converting them to decimal.
(a) Binary numbers 1011 and 101.
[2 marks]
(b) Hexadecimal numbers 2E and 34
[2 marks]

Answer

a) 1011+101 = 10000
   a. 1011*101 = 1011+00000+1011100 = 110111

b)2E*34 = 1B8+8A0 = 958

b.2E + 34 = 62

4. Convert the hexadecimal number 64CD to binary, and then convert it from binary to octal.

[2 marks]

Answer

64CD = 110010011001101

6 – 2^2+2^1 = 0110

4 – 2^2 =0100

C – 12 – 2^3+2^2 = 1100

D – 13 – 2^3+2^2+2^0 = 1101

Binary to Octal

110 – 6

010 – 2

011 – 3

001 – 1

101 – 5

110010011001101 = 62315 base 8

5. What is the exact number of bytes in a system that contains
(a) 32K bytes
[1 mark]
(b) 64M bytes
[1 mark]
(c) 6.4G bytes
[1 mark]

<u>Answer</u>

a. For 32k bytes:

1 kilobyte (KB) = 1024 bytes

So, 32 kilobytes = 32 * 1024 bytes = 32,768 bytes

b. For 64m bytes:

1 megabyte (MB) = 1024 kilobytes (KB)

So, 64 megabytes = 64 * 1024 * 1024 bytes = 67,108,864 bytes

c. For 6.4g bytes:

1 gigabyte (GB) = 1024 megabytes (MB)

So, 6.4 gigabytes = 6.4 * 1024 * 1024 * 1024 bytes = 6,871,948,800 bytes

6. Determine the base of the numbers in each case for the following operations to be correct:
(a) 14/2 = 5

[0.5 mark]
(b) 54/4 = 13
[0.5 mark]
(c) 24 + 17 = 40
[0.5 mark]

<u>Answer</u>

a) 14/2=5

Solution: 14_{x}/2_{x}=5_{x} [(1 x x1) + (4 xxº)]/(2xx) = (5 xxº) X (x+4)/2=5 x+4=5\times2 x=10-4 x=6

14/2=5, is correct in base 6.

(b) 54/4=13

Solution: 54_{x}/4_{x}=13_{x} [(5 xx1) + (4 xxº)]/(4xxº) = (1xx1) + (3xx°) (5x+4)/4=(x+3) (5x+4) =4x+12 5x-4x=12-4 x=8

(c) 24+17=40

Solution: 24x/17x=40x [(2\times x) +(4\times x^ {0}) + [(1\times x) +(7\times x^ {0})] = [(4\times x) +(0\times x^{d})] (2x+4) +(x+7) =4x 3x+11=4x 11=4x-3x x=11

7. Convert the following numbers to base 10:
(a) $1100_2 = ?_{10}$

[1 mark]
(b) $1111\ 1111\ 1111_2 = ?_{10}$
[1 mark]
(c) $77_8 = ?_{10}$
[1 mark]
(d) $221_8 = ?_{10}$
[1 mark]
(e) $5BC_{16} = ?_{10}$
[1 mark]

Answer

a) 1100 2^3 + 2^2 = 8+4 = 12
b) 1111 1111 1111 = FFF
= (15*16^2) + (15*16^1) + (15*16^0)
=3840+240+15
=4095 base 10
c) 77 base 8 = (7*8^1) + (7*8^0)
= 56 + 7
=63 base 10
d) 221 base 8 = (2*8^2) + (2*8^1) + (1*8^0)
=128+16+1
=145 base 10
e) 5BC base 16 = (5*16^2) + (11*16^1) + (12*16^0)
=1280+176+12
=1468 base 10

8. Convert the following base 10 numbers to the base indicated:
(a) $56_{10} = ?_2$

(b) $56_{10} = ?_8$
[1 mark]
(c) $56_{10} = ?_{16}$
[1 mark]

(d) $221_{10} = ?_2$
[1 mark]
(e) $221_{10} = ?_8$
[1 mark]
(f) $221_{10} = ?_{16}$
[1 mark]

<u>Answer</u>

a) 56/2 = 28 remainder 0
   28/2 = 14 remainder 0
   14/2 = 7 remainder 0
   7/2 = 3 remainder 1
   3/2 = 1 remainder 1
   1/2 = 0 remainder1
   56 base 10 = 111000 base 2

b) 56/8 = 7 remainder 0
   7/8 = 0 remainder 7
   56 base = 70 base 8

c) 56/16 = 3 remainder 8
   3/16 = 0 remainder 3
   56 base 10 = 38 base 16

d) 221/2 = 110 remainder 1
   110/2 = 55 remainder 0
   55/2 = 27 remainder 1
   27/2 = 13 remainder 1
   13/2 = 6 remainder 1
   6/2 = 3 remainder 0
   3/2 = 1 remainder 1
   ½ = 0 remainder1
   221 base 10 = 11011101 base 2

e) 221/8 = 27 remainder 5
27/8 = 3 remainder 3
3/8 = 0 remainder 3
221 base 10 = 335 base 8

f) 221/16 = 13 – D remainder 13
13/16 = 0 remainder 13 – D
221 base 10 = DD base 16

9. Convert the following numbers from base 10 to base 16
(a) $(2020)_{10}$
[1 mark]
(b) $(2020.65625)_{10}$
[1 mark]
(c) $(172)_{10}$
[1 mark]
(d) $(172.983)_{10}$
[1 mark]

Answer

a) 2020 ÷ 16 = 126 remainder 4 (4 in hex)

126 ÷ 16 = 7 remainder 14 (E in hex)

7 ÷ 16 = 0 remainder 7 (7 in hex)

$(2020)_{10} = (7E4)_{16}$.

Integer part

b) 2020 ÷ 16 = 126 remainder 4 (4 in hex)

$126 \div 16 = 7$ remainder 14 (E in hex)

$7 \div 16 = 0$ remainder 7 (7 in hex)

Fractional part:

$0.65625 \times 16 = 10.5$ (A in hex)

$0.5 \times 16 = 8.0$ (8 in hex)

$(2020.65625)_{10} = (7E4.A8)_{16}$.

c) Fractional part: $0.983 \times 16 = 15.728$ (F in hex)

$0.728 \times 16 = 11.648$ (B in hex)

$0.648 \times 16 = 10.368$ (A in hex)

$(172.983)_{10} = (AC.BFA)_{16}$.

11. Convert 43.2 base 8 to binary, base 3, decimal and hexadecimal. Any fractions that do not terminate should be truncated to 4 digits in the fractional part. [1.5 marks]

Answer

convert 43.2 base 8 to decimal

$43.2_8=4\times8\hat{}1+3\times8\hat{}0+2\times8\hat{}-1=32+3+82=35.25_{10}$

Binary:

35_{10}=100011 base 2
0.2510=0.01 base 2

13. Each of the following base 10 numbers in signed magnitude, one's complement and two's complement. Each of the numbers should be represented in 8 bits.[7.5 marks]

Base 10	Signed Magnitude Binary Representation	One's Complement Binary Representation	Two's Complement Binary Representation
43	001010111	001010111	001010111
-43	10101011	11010100	11010101
-128	Invalid	Invalid	Invalid
127	01111111	10000000	10000001
-1	100000001	11111110	11111111