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Assignment-1

Q-1/ Convert the Decimal Number 250.5, 87.876 to base 3, base 4, base 7, base 16.

Ans: 250.5 to base 3

250 . 5
Integer Fractional

3 | 250		
3 | 83	1	↑
3 | 27	2	100021
3 | 9	0	
3 | 3	0	
1	0	

0.5 × 3 = 1.5 = 1 + 0.5 — 1
0.5 × 3 = 1.5 = 1 + 0.5 — 1
0.5 × 3 = 1 + 0.5 — 1
0.5 × 3 = 1 + 0.5 — 1
.
.
.
.
.
0.5 × 3 = 1 + 0.5 — 1

1111111111 ...

⟹ $(250.5)_{10} = (100021.1111111111)_3$

250.5 to base 4

250.5

4 | 250		
4 | 62	2	↑
4 | 15	2	3322
3	3	

0	0.5
.	4
2	0

0.2

$(250.5)_{10} - (3322.2)_4$

250.5 to base 7

250.5

7 | 250		
7 | 35	5	↑
5	0	505

0	0.5
.	7
3	5
	7
3	5
	7
3	5
	7
	⋮
3	5
	7

0.333333....

$(250.5)_{10} - (505.333333....)$

Prabhat

250.5 to base 16

250.5

16 | 250	
15	10

0	0.5
	16
8	0

15 10
↓ ↓
F A

$(250.5)_{10} = (FA.8)_{16}$

87.876 to base 3

87 . 876
Integer Fraction

3 | 87	
3 | 29	0
3 | 9	2
3 | 3	0
1	0

10020

0 .	876
	3
2	628
	3
1	884
	3
2	652
	3
1	956
	3
2	868
	3
2	604
	3
1	812
	3
2	436
	3
1	308
	3
0	924

$(87.876)_{10} = (10020.212122121210)_3$

87.876 to base 4

87.876

4	87	3
4	21	1
4	5	1
	1	

$\cdot 1113$

0	876	
		4
3	504	
		4
2	016	
		4
0	064	
		4
0	256	
		4
1	024	
		4
0	096	
		4
0	384	
		4
1	536	
		4
2	144	
		4
	576	

$(87.876)_{10} - (1113.320010012\ldots)_4$

87.876 to base 7

87.876

0	876
	7
6	132
	7
0	924
	7
6	468
	7
3	276
	7
1	932
	7
6	524
	7
3	668
	7

7	87	3
7	12	5
	1	

153

$(87.687)_{10} - (153.6063163\ldots)_7$

87.876 to base 16

0	876
	16
E=14	016
	16
0	256
	16
4	096
	16
0	576
	16
9	216
	16
3	456
	16
7	296
	16
4	736
	16
B=11	776
	16
C=12	416

16	87	7
	5	

57

$(87.876)_{10} - (57.E04093749BC)_{16}$

Q.2/ Convert the decimal number 225.225, 865.987 to binary, octal and hexadecimal.

Sol.1/ 225.225 to binary

225.225

2 | 225		
2 | 112	1	↑
2 | 56	0	
2 | 28	0	11100001
2 | 14	0	
2 | 7	0	
2 | 3	1	
1	1	

0	225
	2
0	450
	2
0	900
	2
1	800
	2
1	600
	2
1	200
	2
0	400
	2
0	800
	2
1	600
	2
1	200
	2
0	400

$(225.225)_{10} = (11100001.0011100110\ldots)_2$

decimal

225.225 to octal

225.225

8 | 225	
8 | 28	1
3	4

341

0	225
	8
1	800
	8
6	400
	8
3	200
	8
1	600
	8
4	800
	8
6	400
	8
3	200
	8
1	600
	8
4	800
	8

$(225.225)_{10} =$

$(341.01631463 14)_8$

225.225 to hexadecimal.

225.225

16 | 225
14 | 1 ↑

14 1
↓
E1

$(225.225)_{10}$ –

~~E1.9~~ $(E1.3999999999)_{16}$

0	225
	16
3	600
	16
9	600
	16
9	600
	16
9	600
	16
9	600
	16
9	600
	16
9	600
	16
9	600
	16
9	600

865.987 to binary

865.987

2	865	1
2	432	0
2	216	0
2	108	0
2	54	0
2	27	1
2	13	1
2	6	0
2	3	1
	1	

1101100001

0	987	2
1	974	2
1	948	2
1	896	2
1	792	2
1	584	2
1	168	2
0	336	2
0	672	2
1	344	2
0	688	2
1	376	

$(865.987)_{10}$ —

$(1101100001.111111100101)_2$

865.987 to octal

865.987

8	865	
8	108	1
8	13	4
	1	5

1541

0	987	
	8	
7	896	
	8	
7	168	
	8	
1	344	
	8	
2	752	
	8	
6	016	
	8	
0	128	
	8	
1	024	
	8	
0	192	
	8	
1	536	
	8	
4	288	
	8	
2	304	

$(865.987)_{10}$ —

$(1541.771260102142)_8$

865.987 to Hexadecimal

865.987

16 | 864
16 | 54 — 1
3 — 6

361

0 | 987
16
F=15 | 792
16
C=12 | 672
16
A=10 | 752
16
C=12 | 032
16
0 | 512
16
8 | 192
16
3 | 072
16
1 | 152
16
2 | 432
16
6 | 912
16
E=14 | 592

$(865.987)_{10}$ =

$(361.FCAC083126E)_{16}$

Q3] Represent the decimal number 8620 in BCD, Excess 3 and gray Code.

Sol^{n}] 8620 in BCD

$(8620)_{10} - (1000\ 0110\ 0010\ 0000)_{BCD}$

8620 in excess 3

$(8620)_{10} - (1011\ 1001\ 0101\ 0011)_{excess\ 3}$

8620 in gray code.

$(8620)_{10} - (1100\ 0101\ 0011\ 0000)_{Gray\ code}$

Q-4) Convert the following Numbers as directed.

(a) $(52)_{10} = (\quad)_2$

$(110100)_2$

(b) $(101\ 001\ 011)_2 = (\quad)_{10}$

$(331)_{10}$

(c) $(111\ 011\ 0)_2 = (\quad)_8$

$(356)_8$

(d) $(68)_{10} = (\quad)_{16}$

$(44)_{16}$.

Q-5) Define Digital System

Sol^{n}) It refers to elements such as hardware, software and networks and their use.

Q-6) Convert following Hexadecimal Number to Decimal:
B28, FFF, F28.

Sol^{n}) B28 to Hexadecimal.

$$(B28)_{16} = 11 \times 16^2 + 2 \times 16^1 + 8 \times 16^0$$
$$= 2816 + 32 + 8$$
$$= (2856)_{10}$$

FFF to Hexadecimal

$$(FFF)_{16} = 15 \times 16^2 + 15 \times 16^1 + 15 \times 16^0$$
$$= 3840 + 240 + 15$$
$$= (4095)_{10}$$

F28 to Hexadecimal

$$(F28)_{16} = 15 \times 16^2 + 2 \times 16^1 + 8 \times 16^0$$
$$= 3840 + 32 + 8$$
$$= (3880)_{10}$$

Q#1 Convert following Octal Number to Hexadecimal and Binary:

414, 574, 725.25

Sol#

414 to Hexadecimal

16 | 414
16 | 25 — 14
1 — 9

19 14 = $(19E)_{16}$
E

414 to Binary

$(110011110)_2$

574 to Hexadecimal

16 | 574
16 | 35 — 14
2 — 3

2 3 14 = $(23E)_{16}$
E

574 to Binary

2 | 574
2 | 287 — 0
2 | 143 — 1
2 | 71 — 1
2 | 35 — 1
2 | 17 — 1
2 | 8 — 1
2 | 4 — 0
2 | 2 — 0
1 — 0

$(1000\ 111\ 110)_2$

to

Binary

)$_2$

ary

2

725.25 to Hexadecimal

16 | 725
16 | 45 5
2 13

2 13 5

(2D5)

0	.25
.	16
4	0

0.4

$(725.25)_{10} - (2D5.4)_{16}$

725.25 to Binary

2 | 725
2 | 362 1
2 | 181 0
2 | 90 1
2 | 45 0
2 | 22 1
2 | 11 0
2 | 5 1
2 | 2 1
1 0

0	.25
	2
0	5
	2
1	0

.01

1011010101

$(725.25)_{10} - (1011010101.01)_2$

Q.3) Convert the following numbers to decimal

(i) $(10001.101)_2$

$1\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1 + 1\times2^0 + 1\times2^{-1} + 0\times2^{-2} + 1\times2^{-3}$

$= 16 + 0 + 0 + 0 + 1 + 0.5 + 0 + 0.125$

$= (17.625)_{10}$

(ii) $(101011.11101)_2$

$1\times2^5 + 0\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0 + 1\times2^{-1} + 1\times2^{-2} + 1\times2^{-3} + 0\times2^{-4} + 1\times2^{-5}$

$= 32 + 0 + 8 + 0 + 2 + 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + 0 + \frac{1}{32}$

$= 43 + 0.5 + 0.25 + 0.125 + 0.03125$

$= (43.90625)_{10}$

(iii) $(0.365)_8$

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

$= 0 + 0.375 + 0.09375 + 0.009765625$

$= (0.478515625)_{10}$

(iv) A3E5

$10\times15^3 + 3\times15^2 + 14\times15^1 + 5\times15^0$

$33750 + 675 + 210 + 5$

$= (34640)_{10}$

(v.) CDA4

$= 12 \times 16^3 + 13 \times 16^2 + 10 \times 16^1 + 4 \times 16^0$

$= 49152 + 3328 + 160 + 4$

$= (52644)_{10}$

(vi) $(11101.001)_2$

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

$= 16 + 8 + 4 + 0 + 1 + 0 + 0 + 0.125$

$= (29.125)_{10}$

(vii) B2D4

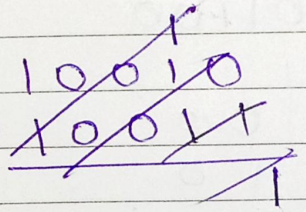
$= 11 \times 16^3 + 2 \times 16^2 + 13 \times 16^1 + 4 \times 16^0$

$= 45056 + 512 + 208 + 4$

$= (45780)_{10}$

Q9) Perform the operation of subtractions with the following binary numbers using 2's complement.

(i) 10010 − 10011



10011 → 1's comp. = 01100

2's comp. = 01101

10010

+ 01101

11111

(ii) 100 − 110000

110000 → 1's comp. − 001111
2's comp − 001111
+ 1
010000

010000
+ 000100
010100

(iii) 11010 − 10000

10000 → 1's comp − 01111
2's comp − 01111
+ 1
10000

11010
+ 10000
01010

(10) Perform operation of subtractions with the following binary numbers using 2's complement.

(i) 100110 − 10011

10011 → 1's comp. − 01100

~~011100~~
~~100110~~
~~111110~~

011100
+ 100110
~~(1)~~ 010010
+ 1
010011

10011

(ii) 1000 - 110000

110000 → 1's Comp = 001111

```
  1000
+ 001111
  ------
  010111
     +1
  ------
  011000
```

011000

(iii) 110101 - 10000

10000 → 1's comp. : 01111

```
  11 111
  110101
+ 01111
  ------
 (1)00100
      +1
  ------
  00101
```

00101

with
's

(11) Give full form for following abbreviation and explain:

(i) ASCII

→ "American Standard Code For Information Interchange"

→ ASCII is a character encoding that uses numeric codes to represent characters. These include upper and lower case English letters, numbers and punctuation symbols.

→ Standard ASCII can represent 128 characters.

→ For instance, a capital "T" is represented by 84, or 01010100 is represented by 116 or 01110100 in binary.

→ Other keyword are also mapped to standard ASCII values.

→ eg. the Escape key (ESC) is 27 in ASCII and the Delete key (DEL) is 127.

(ii) EBCDIC :

→ Extended Binary coded Decimal Interchange Code".

→ EBCDIC is binary code for alphabatic and numeric characters that IBM developed for its larger operating system.

→ EBCDIC uses a unique eight-bit binary code for each number and alphabetic character as well as punctuation mark and accented letters and non-alphabatic characters.

→ First nibble is defines the char as a number and 2nd nibble defines which number is encoded

Q12] Explain weighted codes with examples.

Sol" Weighted binary Codes.

These are those which follow the positional weighting principles where in each position of the number represents a specific weight.

like 8421, 2421 and 5211 are this weighted binary codes.

Eg. BCD, 8421, 6421, 4221, 5211, 3321, ---

Eg. Decimal Number : 24

8, 4, 2, 1
↑ are weights.

So code for 2 : 0010
code for 4 : 0100

The sum of all digits multiply by a weight gives the total amount being represented

Q-13] Find 1's and 2's complement of following binary numbers.

(i) $(10081.101)_2$ (ii) $(101011.11101)_2$

i) 1's complement :- 01110.010

2's complement :- 01110.010

\+ 1.000

01111.010

ii) 1's complement :- 010100.00010

2's complement :- 010100.00010

\+ 1.00000

010101.00010

Q-14] Find 9's and 10's complement of following binary numbers 3405.65, 87.76.

Sol^n • 3405.65

9's complement

9999.99
− 3405.65
6594.34

10's complement

10000.00
− 3405.65
6594.35

(ii) 87.76

9's Complement:

$$\begin{array}{r} 99.99 \\ -\ 87.76 \\ \hline 12.23 \end{array}$$

10's complement:

$$\begin{array}{r} 100.00 \\ 87.76 \\ \hline 12.24 \end{array}$$