DLD Assignment

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1) Convert $(64258)_{10}$ to binary through hex

$$
\begin{array}{r|l l}
16 & 64258 & 2 \\
16 & 4016 & 0 \\
16 & 251 & B \\
 & 15 & F
\end{array}
\Rightarrow (FB02)_{16}
$$

$(FB02)_{16} = (1111\ 1011\ 0000\ 0010)_2$

2) $(15)_{10} \to ()_3, ()_4, ()_5$

$$
\begin{array}{r|l l}
3 & 15 & \\
3 & 5 & -0 \\
 & 1 & -2
\end{array}
\Rightarrow (120)_3
$$

$$
\begin{array}{r|l l}
4 & 15 & \\
 & 3 & -3
\end{array}
\Rightarrow (33)_4
$$

$$
\begin{array}{r|l l}
5 & 15 & \\
 & 3 & -0
\end{array}
\Rightarrow (30)_5
$$

3) BCD of 13597, 93286, 99880

$(13597)_{10} = (0001\ 0011\ 0101\ 1001\ 0111)$

$(93286)_{10} = (1001\ 0011\ 0010\ 1000\ 0110)$

$(99880)_{10} = (1001\ 1001\ 1000\ 1000\ 0000)$

4) $X = 1010100$ $Y = 1000011$

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$X - Y$ & $Y - X$

i) $X - Y$

$X = 1010100$

$Y = 1000011$

1's comp. of $Y \Rightarrow \sim Y = (0111100)_2$

$X + Y =$

```
  1010100
  0111100
  -------
  0010000
        1
  -------
  0010001
```

$X - Y = 0010001$

2's comp of $Y \Rightarrow$

```
  1010100
  0111101
  -------
  0010001
```

$Y - X$

1's comp of $x \Rightarrow \sim X = (0101011)_2$

$Y + X =$

```
  1000011
  0101011
  -------
  1101110
```

no carry so, $\sim$ -

$-(0010001)$

$Y - X = -(10001)_2$

2's comp $\Rightarrow \sim X + 1$

$(0101100)_2$

```
  1000011
  0101100
  -------
  1101111
```

no carry $\Rightarrow$ 2's complement

```
  0010000
        1
  -------
  0010001
```

assign '-'

$y - x = -(10001)_2$

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5) a) $\sqrt{54} = 7$

b) $43 + 34 + 21 + 55 = (111)_{10}$

c) $(211)_n = (152)_8$

d) Encode 0-9 using 6 3 1 -1, 8 4 -2 -1 & Prove they are complimenting BCD

a) $\sqrt{54} = 7$

$\sqrt{54} = \sqrt{(49)_{10}}$

$(54)_n = 49$

$5 \times n + 4 = 49$

$n = 9$

b) $4n + 3 + 3n + 4 + 2n + 1 + 5n + 5 = 111$

$14n = 98$

$n = 7$

c) $2 \cdot n^2 + n + 1 = 64 + 40 + 2$

$2n^2 + n + 1 = 106$

$2n^2 + n - 105 = 0$

$n = 7, -7.5$

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d)

	6	3	-1	1	8	4	-2	-1
0	0	0	0	0	0	0	0	0
1	0	0	1	0	0	1	1	1
2	0	1	0	1	0	1	1	0
3	0	1	0	0	0	1	0	1
4	0	1	1	0	0	1	0	0
5	1	0	0	1	1	0	1	1
6	1	0	0	0	1	0	1	0
7	1	0	1	0	1	0	0	1
8	1	1	0	1	1	0	0	0
9	1	1	0	0	1	1	1	1

$6+3+1-1=9$ $\qquad$ $8+4-2-1=9$

Hence codes are self complementing.

6) $(45)-(25)$, $(-45)+(-25)$

i) $45-25$

$45 = (00101101)_2$

$25 = (00011001)_2$

$25 \Rightarrow$ 2's complement $= 11100110 + 1$

$= (11100111)_2$

$$\begin{array}{r} 00101101 \\ 11100111 \\ \hline 0\,00010100 \\ \hline \end{array}$$

$= 20$

ii) $(-45)+(-25)$

$45 = (00101101)_2$

$25 = (00011001)_2$

$45 \Rightarrow$ 2's complement $= 11010010 + 1$

$= 11010011$

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$\Rightarrow$ 25 $\rightarrow$ 1110 0110 + 1
1110 0111

1101 0011
1110 0111

1011 1010 $\Rightarrow$ 2's comp 01000101 + 1
= $-(01000110)$
= -70

$\therefore (-45) + (-25) = -70$

7) GC $\rightarrow (347)_{16}$ & $(527)_8$

$(347)_{16} \rightarrow (0011\ 1010\ 0111)_2$

0 0 1 1 1 0 1 0 0 1 1 1
↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
0 0 1 0 0 1 1 1 0 1 0 0

Gray code = $(0010\ 0111\ 0100)_2$

$(527)_8 \Rightarrow (101\ 010\ 111)_2$

1 0 1 0 1 0 1 1 1
↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
1 1 1 1 1 1 1 0 0

= $(111111100)_2$

8) 1001010111110 $\rightarrow ()_2$

1 0 0 1 0 1 0 1 1 1 1 1 0
↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
1 1 1 0 0 1 1 0 1 0 1 0 0

$\Rightarrow (1110011010100)_2$

9) (10001110101) — even parity

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step 1:-

$$2^P \geq n+P+1$$

$$n = 11$$

$$2^P \geq 12+P$$

$$P = 4$$

Step 2:-

2^0 2^1 2^2 2^3

P_1 P_2 P_3 P_4

Step 3 :-

D_{15}	D_{14}	D_{13}	D_{12}	D_{11}	D_{10}	D_9	P_8	D_7	D_6	D_5	P_4	D_3	P_2	P_1
1111	1110	1101	1100	1011	1010	1001	1000	0111	0110	0101	0100	0011	0010	0001
1	0	0	0	1	1	1		0	1	0		1		

Step 4:-

P_1 — 1, 3, 5, 7, 9, 11, 13, 15

even parity sattisfied $P_1 = 0$

P_2 — 2, 3, 6, 7, 10, 11, 15

$P_2 = 1$ (∵ even parity not sattisfied)

P_3 :- 4, 5, 6, 7, 12, 13, 14, 15

even parity sattisfied

$P_4 = 0$

P_4 :- 8, 9, 10, 11, 12, 13, 14, 15

$P_8 = 0$ (∵ even parity sattisfied)

Hamming code = 100011101100100

10) a) 001111101010 b) 101110110100

a) D_{12} D_{11} D_{10} D_9 P_8 D_7 D_6 D_5 P_4 D_3 P_2 P_1

0 0 1 1 1 1 1 0 1 0 1 0

information Bits = $\underline{(00111100)_2}$

8 bit data word.

b) D_{12} D_{11} D_{10} D_9 P_8 D_7 D_6 D_5 P_4 D_3 P_2 P_1

1 0 1 1 1 0 1 1 0 1 0 0

information bits = $\underline{(10110111)_2}$ - 8 bit data word

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