[23] (b) $-85_{10} = ?$ (sign-magnitude)

$85_{10} = 1010101_2$

$-85_{10} = \underset{\text{Sign}}{1}\ \underbrace{1010101}_{\text{magnitude}}$

---

[24] (c) $-99_{10} = ?$ (1's comp.)

$99_{10} = 1100011_2$

$-99_{10} = $ 1's comp. of $\overleftrightarrow{01100011}^{\text{8-bit}}$

$= 10011100$

---

[25] (b) $-68_{10} = ?$ (2's comp.)

$68_{10} = 1000100$

$-68_{10} = $ 2's comp. of $\overleftrightarrow{01000100}^{\text{8-bit}}$

$= 10111100$

---

[29] (b) $1\,0011\,0000\,011000_{SM} = ?$ (single-precision)

$-\,11\,0000011\,000_2 = -1.1000011 * 2^{1011}$

$S = 1,\quad E = 01111111 + 1011 = 10001010,\quad F = 1000001100\ldots$

Number $= 1\ \overleftrightarrow{10001010}^{8}\ \overleftrightarrow{10000011\,0000\,0000\,0000000}^{23}$

---

[30] (b) $0\ \ 11001100\ \ 10000111110100100000000 = ?_{10}$

Numer $= (-1)^0\,(1 + 0.1000011111101001) * 2^{(11001100 - 01111111)}$

$= +1.100001111101001 * 2^{1001101}$

33 (b)

$$
\begin{array}{r}
11011001 \\
+\;11100111 \\
\hline
\cancel{1}\,11000000
\end{array}
\qquad
\begin{array}{l}
\longrightarrow -00100111 \longrightarrow -39_{10} \\
\longrightarrow -00011001 \longrightarrow -25_{10} \\
\longrightarrow -01000000 \longrightarrow -64_{10}
\end{array}
$$

36

$$\underset{-120_{10}}{10001000} \div \underset{34_{10}}{00100010} = ?$$

Dividend is −ve, so we need to calculate the positive number that has the same magnitude, i.e. take its 2's complement ⇒ 01111000

$$
\begin{array}{r|l}
 & 00000011 \leftarrow Q \\
\hline
00100010 & 01111000 \\
 & \underline{0100010} \\
 & 00110100 \\
 & \underline{100010} \\
 & 00010010 \leftarrow R
\end{array}
$$

Since Dividend is −ve & Divisor is +ve

Quotient $= -Q =$ 2's comp. of (00000011)

$= 11111101 \leftarrow -3_{10}$

Remainder $= -R =$ 2's comp. of (00010010)

$= 11101110 \leftarrow -18_{10}$

---

34 (b)

$$
\begin{array}{r}
01100101 \\
-\;11101000 \\
\hline
01100101 \\
+\;00011000 \\
\hline
01111101
\end{array}
\qquad
\begin{array}{l}
\longrightarrow +101_{10} \\
\longrightarrow -00011000 \longrightarrow -24 \\
\\
\\
\\
\longrightarrow +125_{10}
\end{array}
$$

$\boxed{49}$ (h) $547_{10} = ?_{BCD}$

$$\begin{array}{ccc} 5 & 4 & 7 \\ \downarrow & \downarrow & \downarrow \\ 0101 & 0100 & 0111 \end{array}$$

$\boxed{51}$ (h) $0001011010000011_{BCD} = ?_{10}$

$$\begin{array}{cccc} \underbrace{0001} & \underbrace{0110} & \underbrace{1000} & \underbrace{0011} \\ & \downarrow & \downarrow & \downarrow \\ 1 & 6 & 8 & 3 \end{array}$$

$\boxed{53}$ (e)

$$\begin{array}{rrl} & 0010 & 0101 \\ + & 0010 & 0111 \\ \hline & 0100 & 1100 \leftarrow >1001 \\ + & & 0110 \leftarrow \text{Correction} \\ \hline & 0101 & 0010 \end{array}$$

$\boxed{56}$ (b) $1001010_2 = ?_{Gray}$

$$\begin{array}{ccccccccccccc} 1 & \oplus & 0 & \oplus & 0 & \oplus & 1 & \oplus & 0 & \oplus & 1 & \oplus & 0 \\ \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow \\ 1 & & 1 & & 0 & & 1 & & 1 & & 1 & & 1 \end{array}$$

$\boxed{57}$ (b) $00010_{Gray} = ?_2$

$$\begin{array}{ccccc} 0 & 0 & 0 & 1 & 0 \\ \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ 0 & 0 & 0 & 1 & 1 \end{array}$$

$\boxed{64}$ (a) $1111\ 0110_2$ ✓ or ✗ ?

\# of 1's = 6 ← even

since odd parity is used ⟹ there is an error!

$\boxed{65}$ (a) $\boxed{?}\,1010\,0100_2$ even parity

\# of 1's = 3 ← odd

since even parity is used ⟹ parity bit = 1

Answer : $\boxed{1}\,1010\ 0100$
