Q[5.34]: (Text Book, 3rd Ed)

(a)
$$X[0] = \sum_{n=0}^{N-1} x[n]\, e^{\frac{-j2\pi n(0)}{N}}$$
$$= \sum_{n=0}^{N-1} x[n]\,(1)$$
$$= -3+5+45-15-9-19-8+21-10+23$$
$$= \underline{\underline{30}}$$

(b)
$$X[5] = \sum_{n=0}^{N-1} x[n]\, e^{\frac{-j2\pi n(\cancel{5})}{\cancel{10}}}$$
$$= \sum_{n=0}^{N-1} x[n]\, e^{-j\pi n} = \sum_{n=0}^{N-1} x[n]\,(-1)^n$$
$$= -3-5+45+15-9+19-8-21-10-23$$
$$= \underline{\underline{0}}$$

(c) from IDFT $\rightarrow$ $x[n] = \frac{1}{N} \sum_{k=0}^{N-1} X[k]\, W_N^{-kn}$

at $n=0 \rightarrow$ $N x[0] = \sum_{k=0}^{N-1} X[k]$

$$\rightarrow \sum_{k=0}^{N-1} X[k] = N x[0] = 10(-3) = \underline{\underline{-30}}$$

Q[5.35]: (Text Book, 3rd Ed)

$X[k]$	11	$8-j2$	$1-j12$	$6+j3$	$-3+j2$	$2+j$	15	$2-j$	$-3-j2$	$6-j3$	$1+j12$	$8+j2$
k	0	1	2	3	4	5	6	7	8	9	10	11

for a length-N real sequence, the DFT has the following property:

$$\boxed{X[k] = X^*[\langle -k \rangle_N]}$$, hence

$$X[7] = X^*[\langle -7 \rangle_{12}] = X^*[5] = 2-j$$
$$X[8] = X^*[\langle -8 \rangle_{12}] = X^*[4] = -3-j2$$
$$X[9] = X^*[\langle -9 \rangle_{12}] = X^*[3] = 6-j3$$
$$X[10] = X^*[\langle -10 \rangle_{12}] = X^*[2] = 1+j12$$
$$X[11] = X^*[\langle -11 \rangle_{12}] = X^*[1] = 8+j2$$

(a)

$$x[n] = \frac{1}{N} \sum_{k=0}^{N-1} X[k]\, W_N^{-kn} \quad \text{(IDFT)}$$

$\rightarrow$ at $n=0 \rightarrow x[0] = \frac{1}{12} \sum_{k=0}^{N-1} X[k] = \underline{\underline{4.5}}$

(b)

$$x[6] = \frac{1}{N} \sum_{k=0}^{N-1} X[k]\, e^{\frac{j\cancel{2}\pi k(6)}{\cancel{12}}} \Rightarrow x[6] = \frac{1}{12} \sum_{k=0}^{N-1} X[k]\,(-1)^k$$

$$\rightarrow x[6] = \frac{-10}{12} = \underline{\underline{0.833}}$$

(c)

$$X[k] = \sum_{n=0}^{N-1} x\, W_N^{kn} \rightarrow (\text{at } k=0) \rightarrow \sum_{n=0}^{N-1} x[n] = X[0]$$

$$\rightarrow \sum_{n=0}^{N-1} x[n] = \underline{\underline{11}}$$