1.25 Represent the decimal number 6,514 in (a) BCD, (b) excess-3 code, (c) 2421 code, and (d) a 6311 code.

Ans.

	$(6514)_{10}$
(a) BCD	0110 0101 0001 0100
(b) Excess 3	1001 1000 0100 0111
(c) 2421	1100 1011 0001 0100
(d) 6311	1000 0111 0001 0101

1.28 Write the expression "George B." in ASCII, using an eight-bit code. Include the period and the space. Treat the leftmost bit of each character as a parity bit. Each eight-bit code should have odd parity. (George Boole was a 19th-century mathematician. Boolean algebra, introduced in the next chapter, bears his name.)

Ans.

G	e	o	r	g
1100 0111	1110 0101	1110 1111	1111 0010	0110 0111
e	(space)	B	.	
1110 0101	0010 0000	1100 0010	1010 1110	

* Add the 8th bit, a parity bit (red), to ensure that each code has odd parity (total number of 1 is an odd value).

2.1 Demonstrate the validity of the following identities by means of truth tables:
(a) DeMorgan's theorem for three variables: $(x + y + z)' = x'y'z'$ and $(xyz)' = x' + y' + z'$

Ans.

(a)

$x\,y\,z$	$x+y+z$	$(x+y+z)'$	x'	y'	z'	$x'y'z'$
0 0 0	0	1	1	1	1	1
0 0 1	1	0	1	1	0	0
0 1 0	1	0	1	0	1	0
0 1 1	1	0	1	0	0	0
1 0 0	1	0	0	1	1	0
1 0 1	1	0	0	1	0	0
1 1 0	1	0	0	0	1	0
1 1 1	1	0	0	0	0	0

$x\,y\,z$	(xyz)	$(xyz)'$	x'	y'	z'	$x'+y'+z'$
0 0 0	0	1	1	1	1	1

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

2.3 Simplify the following Boolean expressions to a minimum number of literals:
(a)* $A'B'C + AB'C + BC$ (b)* $x'y'z' + y'z$

Ans.

(a) $A'B'C + AB'C + BC = B'C + BC = C$

(b) $x'y'z' + y'z = y'(x'z' + z) = y'(x' + z) = x'y' + y'z$

2.9 Find the complement of the following expressions:
(a)* $x'y' + xy$ (b) $ac + ab' + a'bc'$

Ans.

(a)

$F = x'y' + xy$

$F' = (x'y' + xy)' = (x'y')'(xy)' = (x + y)(x' + y') = xy' + x'y$

(b)

$F = ac + ab' + a'bc'$

$F' = (ac + ab' + a'bc')'$

$= (ac)'(ab')'(a'bc')'$

$= (a' + c')(a' + b)(a + b' + c)$

$= (a' + a'b + a'c' + bc')(a + b' + c)$

$= [a'(1 + b + c') + bc'](a + b' + c)$

$= (a' + bc')(a + b' + c)$

$= (a' + bc')[a + (bc')']$

$= (a' + x)(a + x')\ assume: bc' = x$

$= a'x' + ax$

$= (a\ xnor\ x) = (a\ xnor\ bc')$