Q1:

AB CD→ ↓	00	01	11	10
00	1	0	0	1
01	1	1	0	0
11	1	1	0	0
10	1	0	0	1

In the above K-map, 1) grouping all the cells with blue back ground gives the minterm BC'
2) grouping all the cells with yellow back ground gives the minterm B'D'

So simple Boolean expression of the given K-map is = BC' + B'D'

Note that the yellow grouping is actually four corners of a K-map. They are actually *adjacent* in the sense of one-bit difference between columns and row labels, if you think about it.

Answer: c

Q2:

AB CDE→ ↓	000	001	011	010	110	111	101	100
00	1	1	1	1	1	1	1	1
01	1	0	0	1	1	0	0	1
11	1	0	0	1	1	0	0	1
10	1	1	1	1	1	1	1	1

Direct inspection of the cells that contain 0's tell us that the intersection of row B' (01 and 11 rows combined together) and the column E' (001, 011, 111 and 101 all combined together) has the 0's. Thus, the SOP expression contains only one sum term B'+E'.

Alternative Answer:
We know that (f'(A,B,C,D,E))' = f(A,B,C,D,E). Consider Sum of Products form of f'(A,B,C,D,E) which is actually BE (the cells that contain B to be ON and E to be ON for the SoP interpretation in other words by grouping all blue background cells). Therefore (f'(A,B,C,D,E))'=(BE)'=B'+E'= f(A,B,C,D,E) which is in the Product of Sums form.

Answer:d

Q3:   *d* entries in the K-map denote don't-care terms.

AB CD→ ↓	00	01	11	10
00	1	0	0	1
01	1	1	0	*d*
11	1	*d*	0	*d*
10	*d*	0	0	1

by grouping all blue back ground cells, we get the product term D'

AB CD→ ↓	00	01	11	10
00	1	0	0	1
01	1	1	0	*d*
11	1	*d*	0	*d*
10	*d*	0	0	1

by grouping yellow background cells, we get the product term BC'

So, for the given K-map SoP form is : D' + BC'

answer: c

Q4:

X_1 X_2X_3 ↓	00	01	11	10
0	0	1	1	1
1	0	1	0	0

SoP form is $X_2'X_3 + X_1'X_2$
It needs 2 AND gates and 1 OR gate.

answer : b

Q5: n bit binary number can respresent 2^n numbers. 2^n numbers need $\lceil \log_3 2^n \rceil$ bits.

answer : c

Q6:
2000 / 16 = 125   remainder **0**
125 / 16 = 7   remainder **13 (D in hexadecimal)**
7 / 16 = 0   remainder **7**
$(2000)_{10} = (7D0)_{16}$

Check the answer:
      $7 * (16^2) + D * (16^1) + 0 * (16^0)$
      $7 * 256 + 13 * 16 + 0 * 0$
      $1792 + 208 + 0$
       2000

answer : 7D0

Q7: When minterms are grouped to form a quad, all the minterms of the quad have $n - 2$ variables. A quad would have four combinations of the two variables that get eliminated. Hence the final answer has $n - 2$ variables.

Answer $n - 2$

Q8:

	$(F_1 . F_2)$	$(F_1 . F_2)'$	$(F_1 . F_2)' + F_3$	$((F_1 . F_2)' + F_3)'$
F_2 $=\Sigma(4,5,7)$	$\Sigma(5,7)$	$\Sigma(0,1,2,3,4,6)$	$\Sigma(0,1,2,3,4,6)$	$\Sigma(5,7)$
F_2 $=\Sigma(5,6,7)$	$\Sigma(5,7)$	$\Sigma(0,1,2,3,4,6)$	$\Sigma(0,1,2,3,4,6)$	$\Sigma(5,7)$
F_2 $=\Sigma(0,5,7)$	$\Sigma(5,7)$	$\Sigma(0,1,2,3,4,6)$	$\Sigma(0,1,2,3,4,6)$	$\Sigma(5,7)$
F_2 $=\Sigma(2,5,7)$	$\Sigma(2,5,7)$	$\Sigma(0,1,3,4,6)$	$\Sigma(0,1,3,4,6)$	$\Sigma(2,5,7)$

Answer : d

Q9: The 32 bit binary representation of two unsigned integer variables X and Y are $(D1E70000)_{16}$ and $(52E00000)_{16}$ respectively. What is the value of $X - Y$.

$X - Y = (D1E70000)_{16}$

$(52E00000)_{16}$

$(7F70000)_{16}$

Answer: a

Q10: Let r denote a radix number system.The value(s) of r that satisfy the equation $(\sqrt{121})_r = (11)_r$ is (are)

- r cannot be 1 or 2, it has to be > 2 as we have number 2 in number given $\sqrt{121}$.
- Check for value other than 10 or 11. Let's check for 3 $(\sqrt{121})_3 = \sqrt{16} = 4 = (11)_3$

Answer: d

Q.11: In a radix number system if $(123)_X = (12X)_3$. What values can x take?
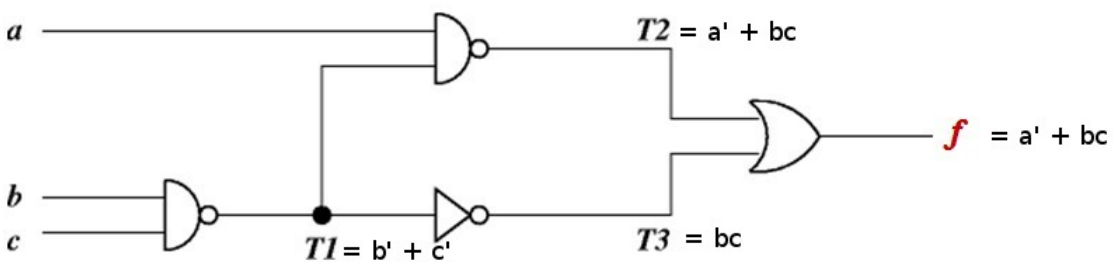Expand the numbers using their respective weights for the positions.

$(123)_X = (12X)_3$

$1*x^2+2*x+3 = 1*3^2+2*3+x$

$x^2+2x+3 = 9+6+x$

$x^2+x-12 = 0$

$(x-3)*(x+4) = 0$

x= 3 or -4

Answer: 3, -4

Q12: The hexadecimal equivalent of the octal number$(77777777)_8$ is

$(77777777)_8$ = (111 111 111 111 111 111 111 111)$_8$ = (1111 1111 1111 1111 1111 1111)$_{16}$ = $(FFFFFF)_{16}$
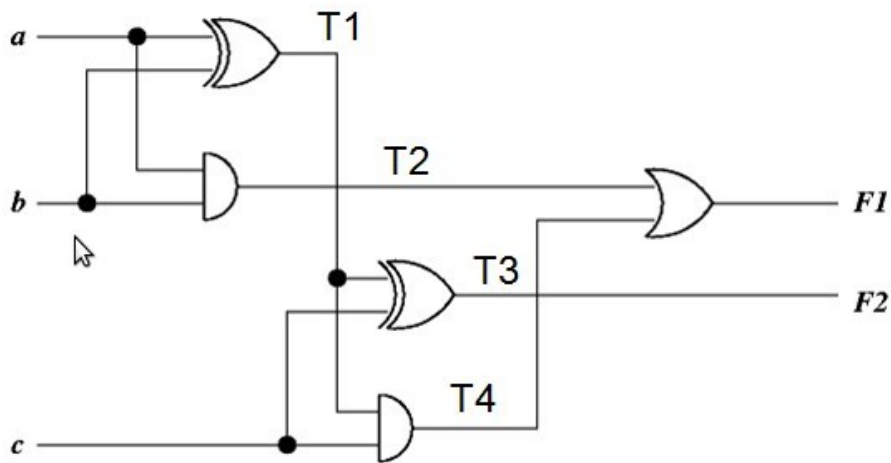
Answer: b

Q13:

$T2 = a' + bc$

$f = a' + bc$

$T1 = b' + c'$

$T3 = bc$

Answer: c

Q14:

a	b	c	F1	F2
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

Answer:
F1 is 1 when the majority of the inputs are 1
F2 is 1 when odd number of inputs are 1

Q.15: (10.A5)$_{16}$ = 16.64453125

1*16 + 0 * 1 + 10 * 1/16 + 5 * 1/16^2 calculated to all digits of precision is the final answer. All the digits are required for it to be accepted as a correct answer. Some of you probably tried with only a few digits. That would be marked as incorrect.