Chapters 6 to 8 Homework

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Real Number Representation:

1) Represent the number 263.3 in 32-bit floating point representation.

2) Represent the number -17.625 in 32-bit floating point representation.

3)

(a) Using the 2's complement method, express the following negative numbers in binary (use 5-bit binary system) -7, -12.

(b) Using the 2's complement method, find the value of the following:

(i) 39 + (-25)

(ii) 43 - (+71)

Boolean Algebra, Logic Gates, Karnaugh Maps:

4) Simplify the following Boolean Expression using Boolean laws:

$$F_1 = A.B.C + \bar{A} + A.\bar{B}.C$$

$$F_2 = \bar{A}.\bar{B}.\bar{C} + \bar{A}.\bar{B}.C + \bar{A}.\bar{C}$$

$$F_3 = (A.\bar{B}.(C + B.D) + \bar{A}.\bar{B}).C$$

(mention which laws you are using in which step)

5) Given the Boolean function:

$$F = AB'C + A'B'C + D'AB + DA'B + DAB$$

find the following:

(a) Obtain the truth table of the function.

(b) Simplify the function to a minimum number of laterals using Boolean algebra.

(c) Obtain the truth table of the function using the simplified expression.

6) For the following function:

$$\left.\begin{array}{l}(a)\ F = DA + BC \\ (b)\ F = A + BC\end{array}\right\} \begin{array}{l}\text{Prove } F + F' = 1 \ \& \\ \qquad F \cdot F' = 0\end{array}$$

7) Demonstrate by means of truth tables the validity of the following identities:

(a) De-Morgan's theorem for three variables: (A+B+C)' = A'B'C' and (ABC)'=A'+B'+C'

(b) The distributive law: A+BC = (A+B) (A+C)

8) Reduce the following Boolean expressions to the indicated number of literals (using laws and mention names of laws you are using in which step):

(a) $R'T' + RST + RT'$ **to three literals**

(b) $(R'S' + T)' + T + RS + UT$ **to three literals**

(c) $R'S(U' + T'U) + S(R + R'TU)$ **to one literals**

(d) $(R' + T)(R' + T')(R + S + T'U)$ **to four literals**

9) Using only minimum gates, draw a logic gate diagram for the following expressions:

$$F_1 = A.B.C + \bar{A} + A.\bar{B}.C$$

$$F_2 = \bar{A}.\bar{B}.\bar{C} + \bar{A}.\bar{B}.C + \bar{A}.\bar{C}$$

$$F_3 = (A.\bar{B}.(C + B.D) + \bar{A}.\bar{B}).C$$

Karnaugh Maps:

10) Simply the following functions using 3 variable maps:

(a) $F(x,y,z) = \Sigma(0,2,6,7)$ (b) $F(x,y,z) = \Sigma(0,2,3,4,6)$

(c) $F(x,y,z) = \Sigma(0,1,2,3,7)$ (d) $F(x,y,z) = \Sigma(3,5,6,7)$

11) Simplify the following Boolean expressions, using three-variable maps:

(a) $F(x,y,z) = xy + x'y'z' + x'yz'$ (b) $F(x,y,z) = x'y' + yz + x'yz'$

(c) $F(x,y,z) = x'y + yz' + y'z'$ (d) $F(x,y,z) = xyz + x'y'z + xy'z'$

Induction and Recursion:

12) Prove by induction the recursive formula for the Fibonacci numbers:

F1 = 1
F2 = F1
F3 = F1+F2
F4 = F2+F3
F5 = F3+F4

Define the two Recursive Formula Rules, with the basic rule and the recursive rule.

Then, using the below information, validate the formula for Fn.

n = 1 2 3 4 5 6 7 8 9 10 11 12...

n =	1	2	3	4	5	6	7	8	9	10
fn =	1	1	2	3	5	8	13	21	34	55
sum fn =	1	2	4	7	12	20	33	54		

Notice from the table it appears that the sum of the first n terms is the (nth+2) term minus 1

Let P(n) be the statement $f_1+f_2+f_3+\ldots f_n=f(n+2) - 1$

Prove P(n), for all n.