

COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Govt. of Maharashtra)

Solution - End-Semester Exam 2011

(CT 202) Digital Systems

Class: - S. Y. B. Tech (Computer Engineering/Information Technology)

Year: - 2011-12

Semester: - III

Q.1. B) Digital Systems and especially their Controllers can be described as Finite State Machines (FSMs)

Design of FSMs Involves

- Defining states
- Defining transitions between states
- Optimization / minimization

Q.4. B)

A	B	C	F ₁	F ₂
0	0	0	1	1
0	0	1	1	0
0	1	0	1	0
0	1	1	0	0
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	0	1

	BC		B	
A	00	01	11	10
0	1	1	0	1
1	1	0	0	0

$$F_1 = \overline{A}B + \overline{A}C + \overline{B}C$$

$$F_1' = AB + AC + BC$$

	BC		B	
A	00	01	11	10
0	1	0	0	0
1	0	1	1	1

$$F_2 = AB + AC + \overline{A}BC$$

$$F_2' = \overline{A}C + \overline{A}B + \overline{A}BC$$

Designing using a PLA, a careful investigation must be taken in order to reduce the distinct product terms. Both the true and complement forms of each function should be simplified to see which one can be expressed with fewer product terms and which one provides product terms that are common to other functions.

The combination that gives a minimum number of product terms is:

$$F_1' = AB + AC + BC \text{ or } F_1 = (AB + AC + BC)'$$

$$F_2 = AB + AC + A'B'C'$$

This gives only 4 distinct product terms: AB, AC, BC, and A'B'C'.

PLA programming table

	Product term	Inputs A B C	Outputs	
			(C)	(T)
			F_1	F_2
AB	1	1 1 -	1	1
AC	2	1 - 1	1	1
BC	3	- 1 1	1	-
\overline{ABC}	4	0 0 0	-	1

For each product term, the inputs are marked with 1, 0, or - (dash). If a variable in the product term appears in its normal form (unprimed), the corresponding input variable is marked with a 1.

