CBCS SCHEME

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20ELD14

First Semester M.Tech. Degree Examination, June/July 2023
Digital Circuits and Logic Design

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Consider the switching function 'f' $f(x_1, x_2, x_3, x_4) = \sum(3, 5, 7, 10, 12, 14, 15)$. Find a minimal threshold logic realization. **(10 Marks)**

b. Determine the following functions are threshold or not:
(i) $f_1(x_1, x_2, x_3) = \sum(0, 2, 4, 5, 6)$ (ii) $f_2(x_1, x_2, x_3) = \sum(0, 3, 5, 6)$
If the given functions are threshold, then write down the threshold gate. **(10 Marks)**

OR

2 a. Explain threshold element. Also list out the limitations of threshold element. **(10 Marks)**

b. Explain finite-state model with equations and examples. **(10 Marks)**

Module-2

3 a. Explain fault detection by path sensitizing method with an example. **(10 Marks)**

b. For the circuit shown in Fig.Q3(b).
(i) Using path sensitization approach, find all the tests to detect input A′ s-a-0.
(ii) For a given (ABCD) = (1 1 1 1), show all the single faults detected.

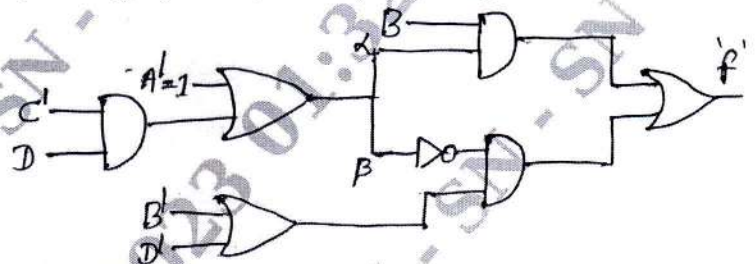

Fig.Q3(b) **(10 Marks)**

OR

4 a. For the circuit shown in Fig.Q4(a), find all the tests to detect the faults x_3 s-a-0 and x_3 s-a-1.

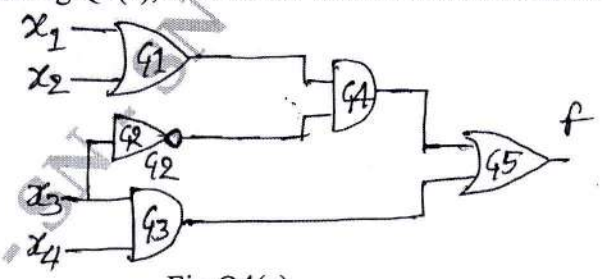

Fig.Q4(a) **(10 Marks)**

b. Use the map method to find a minimal set of tests for multiple faults for the 2-level AND-OR realization of the function $f(w,x,y,z) = w\bar{z} + x\bar{y} + \bar{w}x + w\bar{x}y$. **(10 Marks)**

Module-3

5 a. Explain the preset type of fault-location experiment by considering the fault table as shown in Table.Q5(a). Write down corresponding (i) Reduced Table (ii) Fault Dictionary. Also find out different sets of faults.

	f_1	f_2	f_3	f_4	f_5	f_6
T1					1	1
T2	1		1		1	
T3				1	1	
T4		1	1			
T5	1					1
T6	1		1			1

Table.Q5(a)

(10 Marks)

b. Find the equivalent partition for the machine shown in Table.Q5(b).
(i) Show the standard form of the corresponding reduced machine.
(ii) Find a minimum length sequence that distinguishes state B from state C.

PS	NS, Z	
	X = 0	X = 1
A	F, 0	B, 1
B	G, 0	A, 1
C	B, 0	C, 1
D	C, 0	B, 1
E	D, 0	A, 1
F	E, 1	F, 1
G	E, 1	G, 1

Table.Q5(b)

(10 Marks)

OR

6 a. What is merger graph? Draw the merger graph and reduced graph for the machine in Table.Q6(a).

PS	NS, Z			
	I1	I2	I3	I4
A	–	E, 1	B, 1	–
B	–	D, 1	–	F, 1
C	F, 1	–	–	–
D	–	–	C, 1	–
E	C, 0		A, 0	F, 1
F	D, 0	A, 1	B, 0	–

Table.Q6(a)

(10 Marks)

b. Find the tests to detect the Faults at x3 s-a-0 and s-a-1 for the circuit shown in Fig.Q6(b).

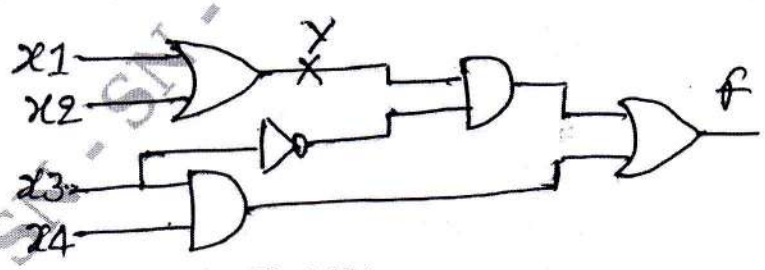

Fig.Q6(b)

(10 Marks)

Module-4

7 a. For the machine in Table.Q7(a), determine the π-lattice, and basic partitions.

PS	NS, Z	
	X = 0	X = 1
A	E	B
B	E	A
C	D	A
D	C	F
E	F	C
F	E	C

Table.Q7(a) **(10 Marks)**

b. For a machine given in Table.Q7(b), give the circuit diagram, and two possible state assignments with their logical equations.

PS	NS, Z			
	Z = 0	Z = 1	Z = 0	Z = 1
A	A	D	0	1
B	A	C	0	0
C	C	B	0	0
D	C	A	0	1

Table.Q7(b) **(10 Marks)**

OR

8 a. Explain : (i) Input-consistent (ii) Output-consistent (iii) Closed partitions with examples. **(10 Marks)**

b. For the machine given in Table.Q8(b). Find:
(i) Closed partitions
(ii) Write down the schematic diagram and π-lattice for machine given in Table.Q8(b).

PS	NS		Z
	X = 0	X = 1	
A	G	D	1
B	H	C	0
C	F	G	1
D	E	G	0
E	C	B	1
F	C	A	0
G	A	E	1
H	B	F	0

Table.Q8(b) **(10 Marks)**

Module-5

9 a. Explain the Homing experiments with example. **(10 Marks)**

b. Explain synchronizing experiments. Find the shortest sequence for the machine given in Table.Q9(b).

PS	NS, Z	
	X = 0	X = 1
A	B, 0	D, 0
B	A, 0	B, 0
C	D, 1	A, 0
D	D, 1	C, 0

Table.Q9(b) **(10 Marks)**

OR

10 a. Explain the adaptive distinguishing experiment by considering the machine shown in Table.Q10(a).

PS	NS, Z	
	X = 0	X = 1
A	C, 0	A, 1
B	D, 0	C, 1
C	B, 1	D, 1
D	C, 1	A, 0

Table.Q10(a)

(10 Marks)

b. Explain the different types of distinguishing experiment with example. **(10 Marks)**

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