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14ELD14

First Semester M.Tech. Degree Examination, Dec.2015/Jan.2016

Digital Circuits and Logic Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Define threshold element. **(05 Marks)**

b. Find if $f(x_1, x_2, x_3, x_4) = x_1x_2x_3'x_4 + x_2x_3'x_4'$ is a threshold function. If yes find the weight threshold vector. **(12 Marks)**

c. The functions $f_1(x_1, x_2, x_3)$ and $f_2(x_1, x_2, x_3)$ are each realizable by a single threshold element. The weight threshold vectors of these elements are, respectively,

$V_1 = \{-1, -1, 1 ; 0\}$ $V_2 = \{1, 2, -1 ; 2\}$

Is the function $x_4f_1(x_1, x_2, x_3) + x_4'f_2(x_1, x_2, x_3)$ realizable by a single threshold element? If yes, give its weight threshold vector. If not, indicate clearly why it is not a threshold function? **(03 Marks)**

2 a. What do you mean by static hazard? How will you eliminate static hazards? Explain with an example. **(04 Marks)**

b. Explain with examples :

i) Preset experiments

ii) Adaptive fault location experiments. **(06 Marks)**

c. In the circuit Fig Q2(c), show that fault e_0 and h_1 are undetectable. **(10 Marks)**

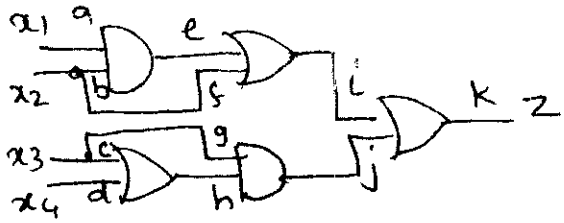

Fig. Q2(c)

3 a. For the function $f(w, x, y, z) = w'y' + y'z + wxz + xyz'$, find a-test and b-test sets. **(10 Marks)**

b. For the circuit shown in Fig.3(b) by sensitizing paths afh, bdfh, begh and cgh, find which faults can be detected. Write the test vectors for those faults. **(10 Marks)**

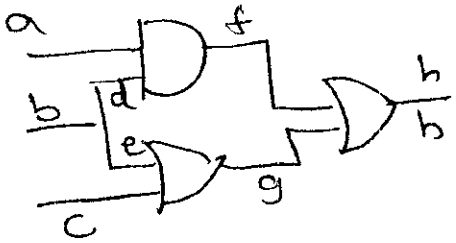

Fig. Q3(b)

4 a. For the machine M4(a) shown, find the equivalence partition and corresponding reduced machine in standard form. **(10 Marks)**

b. For the incompletely specified machine shown in table M4(b), find a minimum state reduced machine containing the original one. **(10 Marks)**

Machine M4(a)

PS	NS, z x = 0	x = 1
A	E, 0	C, 0
B	C, 0	A, 0
C	B, 0	G, 0
D	G, 0	A, 0
E	F, 1	B, 0
F	E, 0	D, 0
G	D, 0	G, 0

Machine M4(b)

PS	NS, z I_1	I_2
A	-	F, 0
B	B, 0	C, 0
C	E, 0	A, 1
D	B, 0	D, 0
E	F, 1	D, 0
F	A, 0	-

5 a. Carry out the serial decomposition of the machine shown in table M5(a). Draw the schematic of diagram and π - lattice. **(10 Marks)**

Machine M5(a)

PS	NS, z x = 0	x = 1	z
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

$\pi_0 = \pi(0)$

$\pi_a = \{\overline{ABGH}, \overline{CDEF}\}$

$\pi_b = \{\overline{AB}, \overline{CD}, \overline{EF}, \overline{GH}\}$

$\lambda_0 = \{\overline{ACEG}, \overline{BDFH}\}$

b. A six state machine is said to have the five closed partitions shown below and no other closed partitions. Is this possible. **(10 Marks)**

$\pi_1 = \{\overline{AC}, \overline{B}, \overline{D}, \overline{EF}\}$ $\quad \pi_4 = \pi(0)$

$\pi_2 = \{\overline{AD}, \overline{BC}, \overline{E}, \overline{F}\}$ $\quad \pi_5 = \pi(I)$

$\pi_3 = \{\overline{AB}, \overline{CD}, \overline{EF}\}$

6 a. Find the closed partitions for the machine shown in table M6(a). **(10 Marks)**

b. For the machine shown in table M6(b). Find the input consistent, output consistent partitions. Carry out the state assignments and Draw the schematic diagram. **(10 Marks)**

Machine M6 (a)

PS	NS x = 0	x = 1
A	E	B
B	E	A
C	D	A
D	C	F
E	F	C
F	E	C

Machine M6 (b)

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

7 a. Write short notes on :
i) Homing experiments ii) Synchronizing experiments. **(10 Marks)**

b. The machine shown in table M7(b) is initially provided with an input sequence 01, to which it responds by producing an output sequence 10.
It is next provided with the sequence 1 0 1 0 1 0 1 0 1 0 0 1 0 0 1 1 0 1 0 0 0 1. Assuming that on malfunction increases the number of states, show that this sequence is fault detection experiment and find the correct o/p sequence. **(10 Marks)**

Machine M7(b)

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

8 a. The input sequence X shown below has been applied to a reduced five state machine whose state table is to be determined. Find the state table in standard form if it is known that its starting state is A.
X: 0 0 0 0 1 0 1 0 1 0 1 0 0 1 0 1 0 0 0 1 0 0 1 0
Z: 0 1 2 0 1 3 2 1 1 0 1 3 3 2 0 1 3 3 3 2 1 2 1 1
X = i/p Z = o/p **(10 Marks)**

b. Show the testing table and graph for the machine shown in table M8(b). Add to the machine one output terminal so that the sequence 11 will be a distinguishing sequence.

Machine M8 (b)

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

(10 Marks)

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