9 (A1)

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08EC029

M.Tech. Degree Examination, Dec 08 / Jan 09
Digital Circuits and Logic Design

Time: 3 hrs. Max. Marks:100

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

1 a. Give physical constructional details of threshold element by means of a magnetic core. **(06 Marks)**

b. Discuss the capabilities and limitations of threshold logic. **(06 Marks)**

c. Determine whether the functions :
$F(x_1, x_2, x_3, x_4) = \sum (0, 1, 3, 4, 5, 6, 7, 12, 13)$ is a threshold functions and if it is, find a weight – threshold vector. **(08 Marks)**

2 a. Analyze the circuit shown in fig,Q2(a) for static hazards, redesign the circuit so that it becomes hazard free. **(07 Marks)**

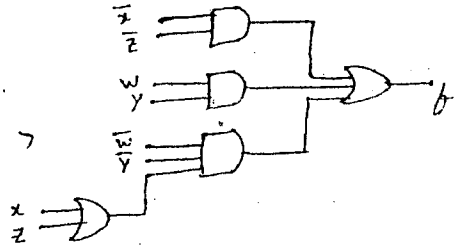

Fig.Q2(a)

b. Given the fault table shown in table Q2(b), where Z denotes the fault free output for the corresponding test. Find a minimal adaptive fault – location experiment. **(07 Marks)**

Tests	Faults					Z
	f_1	f_2	f_3	f_4	f_5	
T_1			1	1	1	0
T_2	1	1				1
T_3				1	1	1
T_4		1				0
T_5					1	1

Table Q2(b)

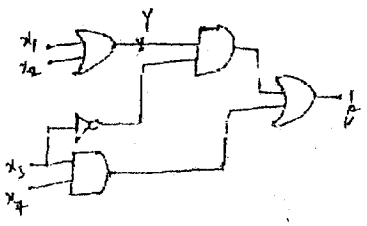

Fig.Q2(c)

c. For the circuit shown in fig.Q2(c), find tests to detect the fault y s – a – 0 and y s – a – 1. **(06 Marks)**

3 a. Explain the basic principles of the path sensitization method. **(05 Marks)**

b. Use the map method to find a minimal set of tests for multiple faults for the 2 – level OR – AND network shown in fig.Q3(b). **(07 Marks)**

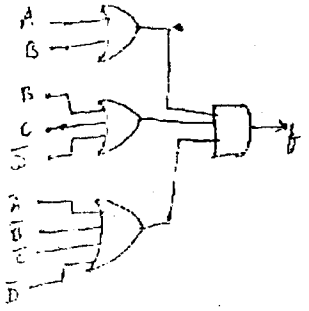

Fig.Q3(b)

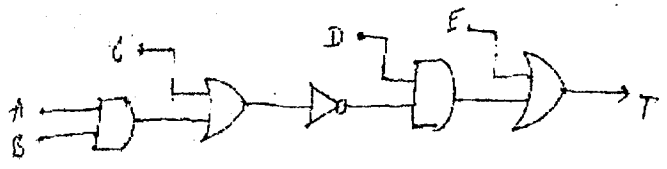

Fig.Q3(c)

c. Show a quadded logic realization of the circuit shown in fig.Q3(c). Indicate the correction of the longest propagated error. **(08 Marks)**

4 a. Discuss the properties of mealy m/c and moore m/c. (03 Marks)

b. Find the equivalence partition for the machine shown in table Q4(b). Show a standard from of the corresponding reduced machine. (10 Marks)

P.S	NS, Z	
	x = 0	x = 1
A	E, 0	D, 1
B	F, 0	D, 0
C	E, 0	B, 1
D	F, 0	B, 0
E	C, 0	F, 1
F	B, 0	C, 0

Table Q4(b)

P.S	NS, Z	
	x = 0	x = 1
A	A, 0	C, 0
B	B, 0	B, -
C	B, 0	A, 1

Table Q4(c)

c. Augment the machine shown in Table Q4(c) by state splitting, determine its minimal form. (07 Marks)

5 a. For the incompletely specified m/c shown in Table Q5(a), construct the merger table and find the set of all maximal compatibilities. (10 Marks)

P.S	NS, Z	
	I_1	I_2
A	E, 0	B, 0
B	F, 0	A, 0
C	E, -	C, 0
D	F, 1	D, 0
E	C, 1	C, 0
F	D, -	B, 0

Table Q5(a)

b. Given the m/c shown in table Q5(b) and 2 assignments α and β. Derive in each case the logical equations of state variables and output function. Explain how the choice of an assignment affects the complexity of the circuit and determines the overall structure of the m/c. (10 Marks)

Table Q5(b)

P.S	NS		Z	
	x = 0	x = 1	x = 0	x = 1
A	A	D	0	1
B	A	C	0	0
C	C	B	0	0
D	C	A	0	1

Assignment α : A → 0 0, B → 0 1, C → 1 1, D → 1 0

Assignment β : A → 0 0, B → 0 1, C → 1 0, D → 1 1

6 a. Define the following : i) Closed partition ii) Input consistent partition iii) Output consistent partition iv) Autonomous clock and determine the same for the m/c shown in table Q6(a). (12 Marks)

P.S	NS, Z	
	x = 0	x = 1
A	E, 0	E, 0
B	D, 0	F, 1
C	F, 0	D, 1
D	A, 0	C, 0
E	C, 0	A, 0
F	B, 0	B, 1

Table Q6(a)

P.S	NS, Z	
	x = 0	x = 1
A	B, 0	C, 0
B	A, 1	F, 1
C	F, 1	E, 0
D	F, 1	E, 1
E	G, 0	D, 0
F	D, 0	B, 0
G	E, 1	F, 0

Table Q6(b)

b. Define closed implication graph and construct the same for the m/c shown in table Q6(b) by identifying the pail of states (A,B). (08 Marks)

7 a. Find the set of Mm pairs for the m/c shown in table Q7(a) **(10 Marks)**

P.S	NS x_1, x_2				Z
	00	01	11	10	
A	C	A	D	B	0
B	E	C	B	D	0
C	C	D	C	E	0
D	E	A	D	B	0
E	E	D	C	E	1

Table Q7(a)

P.S	NS, Z	
	x = 0	x = 1
A	B, 0	A, 0
B	B, 1	C, 1
C	A, 1	D, 0
D	C, 0	A, 1

Table Q7(b)

b. Define homing sequence. Find the shortest homing sequence for the m/c shown in table Q7(b). **(10 Marks)**

8 a. The m/c shown in table Q8(a) is initially provided with an input sequence 0 1 to which it responds by producing an output sequence 1 0. 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. Show that this sequence is a fault – detection experiment for this m/c and find the correct output sequence. **(10 Marks)**

P.S	NS, Z	
	x = 0	x = 1
A	A, 1	B, 0
B	C, 0	A, 0
C	B, 0	C, 1

Table Q8(a)

P.S	NS, Z	
	x = 0	x = 1
A	A, 0	B, 0
B	A, 0	C, 0
C	A, 0	D, 0
D	A, 1	A, 0

Table Q8(b)

b. Show the testing graph for the m/c given in table Q8(b). Add to the m/c one output terminal so that the sequence 1 1 will be a distinguishing sequence. **(10 Marks)**

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