CBCS SCHEME

USN | | | | | | | | | | |

20ELD14

First Semester M.Tech. Degree Examination, Feb./Mar. 2022
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. What is threshold element? Explain its structure briefly. **(07 Marks)**

b. Define a unate function and determine the function $f(x_1, x_2 x_3, x_4)$ realized by the following threshold networks shown in Fig.Q1(b).

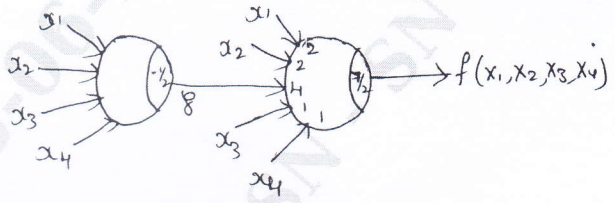

Fig.Q1(b) **(08 Marks)**

c. Explain the limitations and capabilities of finite state machine. **(05 Marks)**

OR

2 a. Determine whether the given function is a threshold function and find its weights and T. $f(x_1, x_2, x_3, x_4) = \Sigma(0, 1, 3, 4, 5, 6, 7, 12, 13)$. **(07 Marks)**

b. State and prove elementary properties of threshold element. **(08 Marks)**

c. Explain Mealcy and Moore machines with examples. **(05 Marks)**

Module-2

3 a. Explain static Hazards and Hazards free circuit with an example. **(07 Marks)**

b. Explain and construct fault table for circuit shown in Fig.Q3(b)and cover a fault table with minimal number of tests.

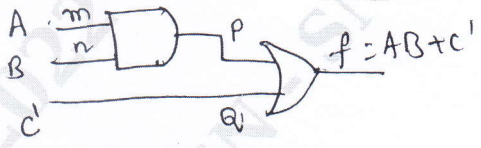

Fig.Q3(b) **(08 Marks)**

c. Explain disadvantage of single dimensional path sensitizing and how to overcome that. **(05 Marks)**

OR

4 a. Explain the design of adaptive decision trees for the location of fault with example. **(07 Marks)**

b. Design the test equivalent AND-OR network and map for the given networks in Fig.Q4(b).

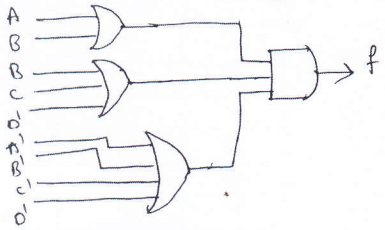

Fig.Q4(b) **(08 Marks)**

c. Explain the structure of quaded logic. **(05 Marks)**

Module-3

5 a. List the properties of Boolean differences. **(08 Marks)**

b. Define compatible states. For the machine shown in Table.Q5(b). Find Augmented machine and corresponding minimal machine.

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

Table Q5(b) **(07 Marks)**

c. Discuss about restoring organs. **(05 Marks)**

OR

6 a. Define merger graph. Find compatible pairs of incompetely specified machine M using merger graph. (Refer Table Q6(a)).

PS	NS, Z			
	I_1	I_2	I_3	I_4
A	–	C, 1	E, 1	B, 1
B	E, 0	–	–	–
C	F, 0	F, 1	–	–
D	–	–	B, 1	–
E	–	F, 0	A, 0	D, 1
F	C, 0	–	B, 0	C, 1

Table Q6(a) **(08 Marks)**

b. For the circuit shown in Fig.Q6(b) find the test to detect fault at "y" when s–a–1 and s–a–0 using Boolean difference chain rule.

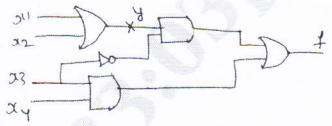

Fig.Q6(b) **(07 Marks)**

c. Discuss the possible strategies in fault Tolerant design. **(05 Marks)**

Module-4

7 a. Determine the π – lattice for the machine shown in Table.Q7(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

Table Q7(b) **(07 Marks)**

b. For the machine shown in Table.Q7(b), if the assignments are as follows, find the logical equation for the machine and draw the realization machine using autonomous clock and draw the autonomous clock of the machine M.

PS	N S		Z	
	X= 0	X= 1	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

Table. Q7(b) **(08 Marks)**

c. Write a note on parallel decomposition. **(05 Marks)**

OR

8 a. For the machine shown in Table Q8(a) give the closed partion by state splitting. Write the corresponding logical equation and implication graph.

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

Table Q8(a) **(08 Marks)**

b. What are covers and implication graphs? Explain. **(07 Marks)**

c. Prove that the product $\pi_1 \pi_2$ and sum $\pi_1 + \pi_2$ of two closed partition on the set of states M are also closed. **(05 Marks)**

Module-5

9 a. Define Homing and synchronizing experiments. Draw the homing and synchronizing tree for the given state table in Table.Q9(a).

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(a) **(08 Marks)**

b. Explain second algorithm for the design of fault detection experiments. **(07 Marks)**

c. Describe the concept of machine identification. **(05 Marks)**

OR

10 a. Prove the theorem, if an n – state machine has a synchronizing or sequences, then it has one such sequences whose length is at most $n(n + 1)(n - 1)/6$. **(10 Marks)**

b. What is an experiment? Explain types of experiments with reference to fault detection. **(06 Marks)**

c. Write a note on diagnosable machines. **(04 Marks)**

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