Bengal Engineering and Science university, Shibpur
M.E(CST) 1st Semester Examination, December, 2011

Subject: Sequential m/c and Automata

Code: CST904
Branch: CST

Time: 3 hours

Full Marks: 70

Answer any five questions

1. i) Show that one way quantum finite automata are more space efficient than their classical counter part. 7
   ii) Show that class of languages recognized by quantum finite automata is a proper subset of regular languages. 7

2. i) Explain how a two way quantum finite automata are more powerful than their classical counterparts. 10
   ii) Mention the drawbacks of two- way quantum finite automata. 4

3. i)Prove that there is no irredundant two level circuit, which has only three primary inputs, that has a test invalidation problem. 6
   ii) Derive a robustly testable circuit using Shannon's expansion theorem for the function.
   $$f = \bar{x}_1x_2 + x_1x_2 + x_3x_4 + \bar{x}_3\,\bar{x}_4 + \bar{x}_1x_3$$ 8

4. i) Write a Simulated Annealing based algorithm in partitioning for reducing energy consumption 10

   ii) How do you reduce Cut size of a circuit with the help of replication? 4

5. i) Define Maximal Monotone Path with an example. 3
   ii) What are the characteristics of Maximal monotones graph? 3
   iii) Illustrate Block level method of staircase path for bi-partition with an example. 8

6. i) Explain multiple missing gate fault model and partial missing gate fault model in a quantum circuit with example. 8

   ii)Test vectors of Single Missing Gate Fault do not cover all test vectors of multiple Missing Gate Fault in a quantum circuit." – Explain with example. 6

7.i) Using trapped ion technology, Explain single and multiple qubits representation of quantum circuit with the help of unitary matrix. 8

ii) What are the smallest number of Fredkin gates needed to simulate Toffoli gate? 4

iii) How many test vectors are required for complete test set of single missing gate fault in quantum circuit? 2

8.i) Find all the races in the flow table of the Table1 and indicate those that are critical and those that are not. 5

ii) Find another assignment which contains no critical races. 9

Table1

$y_1\ y_2$	State x_1x_2 00	01	11	10
00	(00)	11	(00)	11
01	11	(01)	11	11
10	00	(10)	11	11
11	(11)	(11)	00	(11)

9. i) Describe the constrained Left-Edge Algorithm. 4

ii)Using above algorithm, find out the solution for following Routing problem: 10

3	1	3	0	0	5	6	1	3	0	0	0
1	2	4	2	4	1	5	7	0	7	6	0

10.i) Explain the Algorithm of Yoshimura and Kuh of channel routing problem. 8

ii) How does the Dog legging reduce the number of tracks of following net? 6

1	1	2	0	2	4
2	4	0	4	3	3