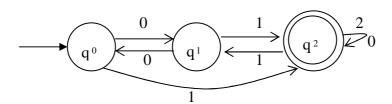**Term End Examination - May 2012**

Course :   ITE203 - Theory of Computation   Slot: C1+TC1
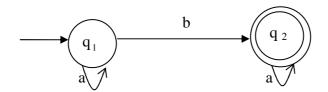
Time   :   Three Hours   Max.Marks:100

PART – A (8 X 5 = 40 Marks)
Answer <u>ALL</u> Questions

1.   "The output can be chosen from some other alphabets rather than the reaching the final state from initial state". Specify the models which focus on the above statement. Also explain the roles of such models.

2.   Differentiate :

   a) Context Free Grammar and Context Free Language

   b) Left most derivation and right most derivation

3.   Find ($\sum^{*}$ - R) for the following transition diagram where $\sum$ = { 0,1,2}.

4.   What do you mean by the equivalence of deterministic finite automaton and non deterministic finite automaton? Explain the associated procedure with a suitable example.

5.   Let G = (V_n , T, P,Q_0) such that V_n = {A, Q_0}, T = {0,1} and P consists of $Q_0 \rightarrow$ 0A0 and A $\rightarrow$ 0A0 | 1. Find the language generated by the grammar G. Draw derivation tree for the obtained language.

6.   Describe the working principle of Push down automata with a block diagram.

7.   Find a regular expression for the following transition diagram:

8. Write short notes on the following:

    a) Universal Turing Machine.

    b) NP Complete and NP Hard.

PART – B (6 X 10 = 60 Marks)
Answer any <u>SIX</u> Questions

9. a) What is the similarity between Kleene's theorem and Arden's theorem? State and prove Arden's theorem with its major applications. **[6]**

    b) List and briefly explain the hierarchy of Chomsky classification. **[4]**

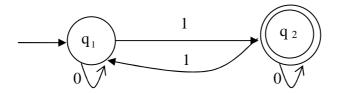10. a) Construct a Mealy machine which is equivalent to the Moore machine as given below: **[6]**

Present State	Next state		Output
	$a = 0$	$a = 1$	
→ q_0	q_3	Q_1	0
q_1	q_1	Q_2	1
q_2	q_2	Q_3	0
q_3	q_3	Q_0	0

    b) List the procedure to convert Mealy machine into Moore machine. **[4]**

11. Determine the minimum state automaton from the transitions which are described in the following transition table:

States	Input symbols	
	0	1
q_0	q_1	q_3
q_1	q_2	q_4
q_2	q_1	q_4
q_3	q_2	q_4
q_4	q_4	q_4

Final state is q_4 in the above table.

12. a) Construct a regular grammar for the following Deterministic Finite Automaton. **[5]**

b) Consider the regular grammar G having productions Q $\rightarrow$ aQ | A , A $\rightarrow$ bB | a , **[5]** B $\rightarrow$ bB | a Find the equivalent regular expression corresponding to regular grammar G.

13. a) Reduce the following grammar to Chomsky Normal Form. It is given that the **[5]** productions are

   $Q_0 \rightarrow$ bAD , A $\rightarrow$ aB | bAB , B $\rightarrow$ b and D $\rightarrow$ c.

   b) Obtain an equivalent grammar in Greibach normal form for the given context free **[5]** grammar having productions

   $Q_0 \rightarrow$ a | AB , A $\rightarrow$ a | BC , B $\rightarrow$ b and C $\rightarrow$ b.

14. a) List the different variations of the Turing machine and explain about multi tape **[4]** Turing machine.

   b) Write short notes on the following: **[6]**

   i. Derivation tree

   ii. Yield

   iii. Nullable Variable

   iv. Turing Machine

15. a) Design a Turing machine that accepts even number of 0's. **[5]**

   b) Check whether the following instances X and Y has a post correspondence **[5]** solution:

   X = (ab, bba, b,baa)

   Y = (abb, ba, aab,b)

16. a) Construct a Push Down Automaton that accepts the language. **[5]**

   L = {$a^n b^n$ | n $\geq$ 1}. Check the acceptability by final state for the string w = aabb.

   b) Construct a pushdown automaton M equivalent to the context free grammar. **[5]**

   $Q_0 \rightarrow$ 0A | 1BB | 0Q_0 , A $\rightarrow$ 1 | 0B , and B $\rightarrow$ 1Q_0 | 1.

$\Leftrightarrow\Leftrightarrow\Leftrightarrow$