Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

BCSE 3308

Fifth Semester (Special) Examination – 2013

AUTOMATA THEORY

BRANCH : CSE

QUESTION CODE : D 293

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following queations : 2×10

   (a) What do you mean by the deterministic nature of the finite automaton ?

   (b) When two finite automaton are equivalent ?

   (c) What is the difference between the languages Φ and $\{\varepsilon\}$? Draw the corresponding DFA's.

   (d) What is Arden's theorm ?

   (e) What's a Turing machine ? What can it compute ?

   (f) Define transition system and transition function with example.

   (g) Define Church-Turing thesis.

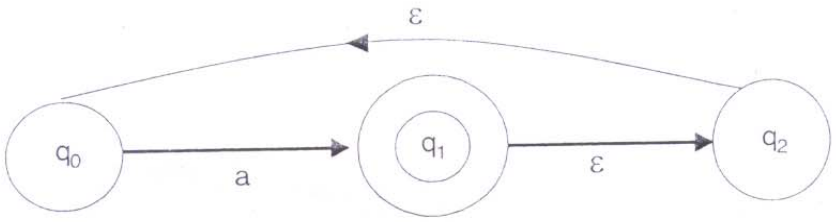
   (h) Explain what it means for a language to be in class P ?

   (i) If a NFA is of having 'n' no. of states then there exists a DFA equivalent to the NFA having how many no. of states ?

   (j) Indistinguishable states vs. distinguishable state.

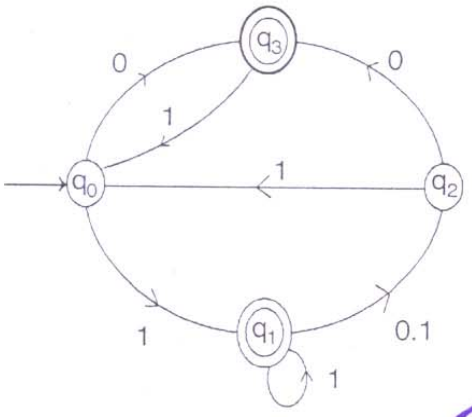
2. (a) Design a DFA that accepts the decimal numbers divisible by 3. 5

   (b) Convert the following ε-NFA to DFA, where the initial state is q_0 5



P.T.O.

3. (a) Convert the following NFA to DFA. 5



(b) Draw the DFA for the language $L=\{ab^5wb^4 : w \in (a,b)^*\}$ 5

4. (a) What is Pumping lemma for regular sets ? Show that $L=\{a^p : p \text{ is a prime}\}$ is not regular. 5

(b) Minimize the finite automata, given in the transition table, where q_0 is the initial state and q_4 is the final state. 5

	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

5. (a) Design a PDA for the language $L=\{wcw^R : w \in (0,1)^*\}$. 5

(b) Show that $L=\{a^m b^m c^n : m,n \geq 1\}$ is context free by designing a CFG that generates L. 5

6. (a) Explain the difference between a recursive language and recursively enumerable language. 5

(b) Design a Turing Machine to find 1's compliment of a binary number. 5

7. (a) Design a Turing Machine for the language $L=\{aa^{n-1}bb^{n-1} : n \geq 1\}$. 5

(b) Define Chomsky Hierarchy and Linear Bounded Automata. 5

8. Write short notes on the followings : 2.5×4

(a) The Halting problem

(b) Turing Reducibility

(c) The Pigeon Hole principle

(d) Chomsky Normal Form.