Printed Pages : 2

ECS403

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0112

Roll No. | | | | | | | | | | |

B.Tech.

(SEMESTER-IV) THEORY EXAMINATION, 2011-12

THEORY OF AUTOMATA & FORMAL LANGUAGES

Time : 3 Hours]

[Total Marks : 100

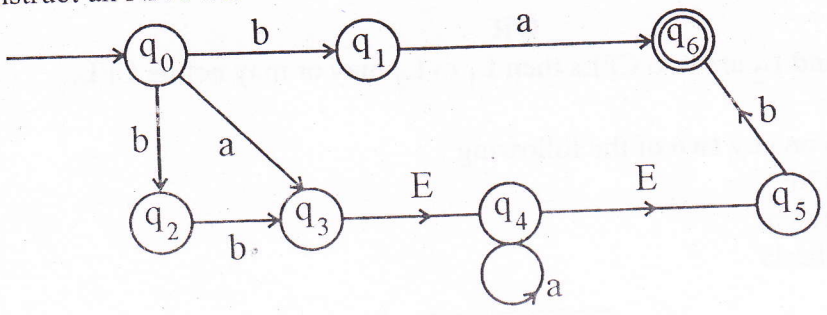
Note : Attempt **all** Section as directed.

Section – A

1. Attempt **all** questions. **All** questions carry equal marks : $2 \times 10 = 20$
   (a) Define deterministic finite automaton.
   (b) State Mxhill-Nerode theorem.
   (c) Find a regular expression corresponding to the language of all strings over the alphabet {0, 1} that contains at least two 0's.
   (d) Differentiate between Mealy machine and Moore machine.
   (e) Show that the context-free gramma G given by productions S → SBS/a, B → b, is ambiguous.
   (f) What do you mean by inherent ambiguous CFL ?
   (g) Compare PDA with FA.
   (h) What do you mean by instantaneous description of PDA ?
   (i) When a language is said to be recursive or recursively enumerable ?
   (j) What are the ways of representations of TMs ?

Section – B

2. Attempt any **three** parts. $3 \times 10 = 30$
   (a) Design a Mealy machine that accepts binary string divisible by 3.
   (b) Construct an NFA without E-mores corresponding to the following NFA.



(c) Show that the language $\{0^n 1^n 2^n \mid n \geq 1\}$ is not a context free language.

(d) Construct PDA by empty stack which accepts the following :
$\{a^m b^m c^n \mid m, n \geq 1\}$

(e) For $\Sigma = \{a, b\}$ design a TM that accepts $L = \{a^n b^n \mid n \geq 1\}$.

Section – C

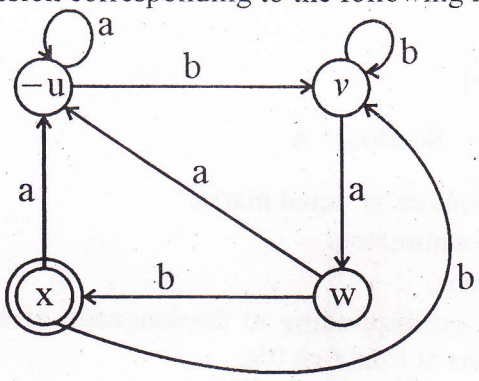
Attempt **all** questions. $5 \times 10 = 50$

3. Prove that if a language L is accepted by an NFA then there is a DFA that accepts L.

OR

Prove that if L is accepted by an NFA with ϵ-transitions, then L is accepted by an NFA without ϵ-transitions.

4. Find the regular expression corresponding to the following Finite Automaton :



OR

Show that $L = \{ ww \mid w \in \{a, b\}^*\}$ is not regular.

5. Construct a PDA M equivalent to the grammar with the following productions :

$S \rightarrow aAA$

$A \rightarrow bS \mid aS \mid a$

Also check whether the string abaaaa is in N(M) or not.

OR

Design 2-stack PDA for language
$L = \{a^n b^n c^n \mid n \geq 0\}$.

6. Convert the following grammar to GNF :

$S \rightarrow ABA$

$A \rightarrow aA \mid \epsilon$

$B \rightarrow bB \mid \epsilon$

OR

Prove that if L_1 and L_2 are two CFLs then $L_1 \cap L_2$ may or may not be CFL.

7. Write short notes on any **two** of the following :
   (a) Universal TM
   (b) Halting Problem
   (c) Church's Thesis