No. of Printed Pages : **4**

BICS-018

00559

B.TECH (COMPUTER SCIENCE AND ENGINEERING)

Term-End Examination

June, 2012

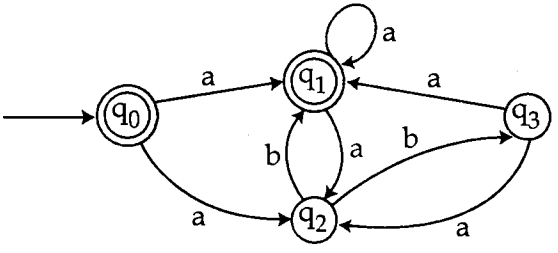
BICS-018 : THEORY OF COMPUTATION

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any seven** questions. All questions carry **equal** marks.*

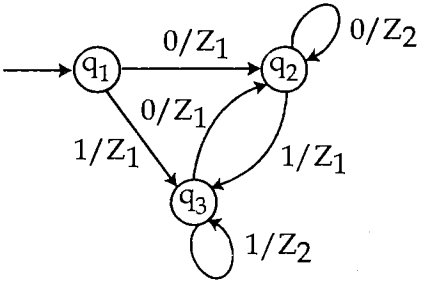
1. (a) Design a finite automata over alphabet $\Sigma = \{a, b\}$ which accepts the set of strings either start with ab or end with ab. **5**

(b) Construct a DFA for given NFA transition diagram : **5**



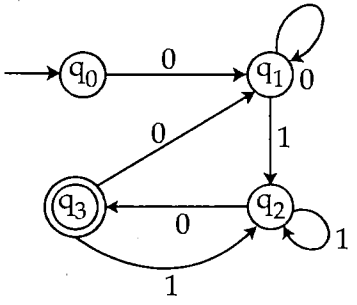
2. (a) Design moore machine to convert each occurence of substring 100 by 101. **5**

(b) Differentiate between mealy and moore machine. Consider a mealy machine : 5



Construct a moore machine equivalent to this mealy machine.

3. (a) Find the regular expression for the given diagram : 5



(b) Construct a Deterministic Finite Automata (DFA) with reduced states equivalent to Regular Expression (RE) 5

$$r = 10 + (0 + 11)0^* 1$$

4. (a) What is pumping lemma for Regular Expression ? Show that the language $L = \{0^i 1^i | i \geq 1\}$ is not regular. 5

(b) Design a Context Free Grammar (CFG) for even and odd palindrome. 5

5. (a) Explain the different normal forms of context free grammar ? Convert the following grammar into CNF. 3+2

$S \rightarrow bA|aB$

$A \rightarrow bAA|aS|a$

$B \rightarrow aBB|b$

(b) What is ambiguous grammar ? Check whether the following grammar is ambiguous ? 5

$S \rightarrow iCtS|iCtSeS$

$C \rightarrow b$

$S \rightarrow a$

6. (a) What is push down automata ? Differentiate between deterministic and non deterministic Push Down Automata with suitable example. 2+3

(b) Construct a Push down automata (PDA) accepting by final state for given language 5

$L = \{a^n b^{2n} \mid n \geq 1\}$

7. For the following PDA M, design the corresponding CFG - 10

The transition function S for the PDA M is as follows :

$S(q_0, a, Z_0) \vdash (q_0, aZ_0)$, $S(q_1, a, a) \vdash (q_2, E)$

$S(q_0, a, a) \vdash (q_0, aa)$, $S(q_2, a, a) \vdash (q_2, E)$

$S(q_0, c, a) \vdash (q_1, a)$, $S(q_2, E, Z_0) \vdash (q_2, E)$

8. What is Turing Machine (TM) ? Design a TM which convert a given binary number into its 2's complements. **3+7**

9. Differentiate between Ram and Turing Machine explain recursive and recursively enumerable languages with its applications. **10**

10. Write short notes on ***any two*** of the following : **5x2=10**

    (a) Church thesis and Rice's theorem.

    (b) NP-complete and NP-Hard problems.

    (c) Decidability and Undecidability.