(i) Printed Pages : 4 Roll No. .....

(ii) Questions : 9

Sub. Code : 3619

Exam. Code : 0461

M.Sc. Information Technology 3rd Semester

(2123)

THEORY OF COMPUTATION

Paper : MS-69

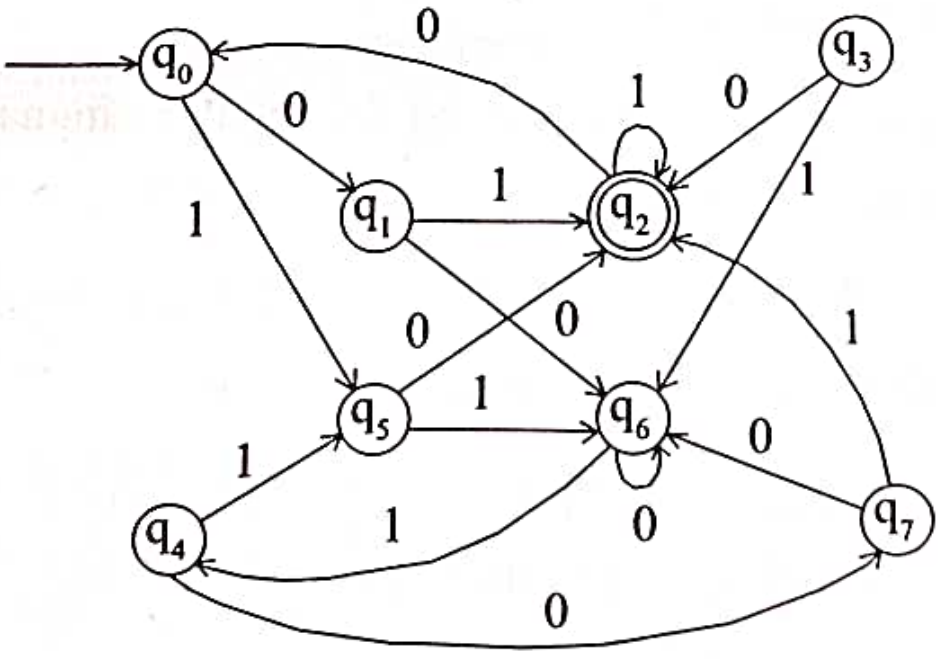
Time Allowed : Three Hours] [Maximum Marks : 80

Note :—Attempt **FIVE** questions in all, selecting **ONE** question from each section. Section-E is compulsory.

SECTION—A

1. (a) Define Finite Automaton. Discuss DFA and NFA with suitable examples. 8

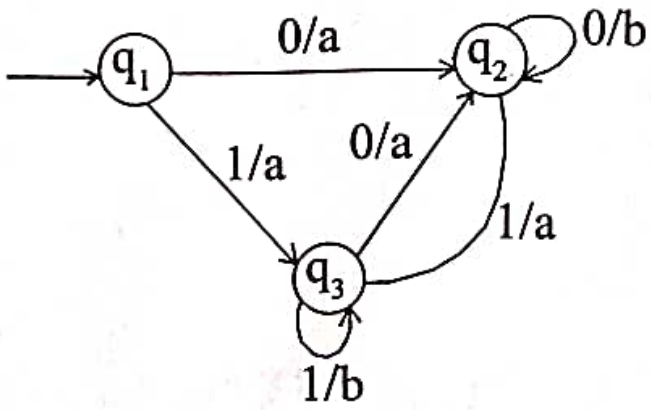
(b) Construct a minimum state automaton equivalent to a DFA whose transition diagram is given below :



8

2. (a) Discuss Chomsky classification of languages. How are classes of languages related to each other ? 8

(b) What are Mealy machines and Moore machines ? Consider a Mealy machine represented by the following figure. Construct a Moore machine equivalent to this Mealy machine.



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SECTION—B

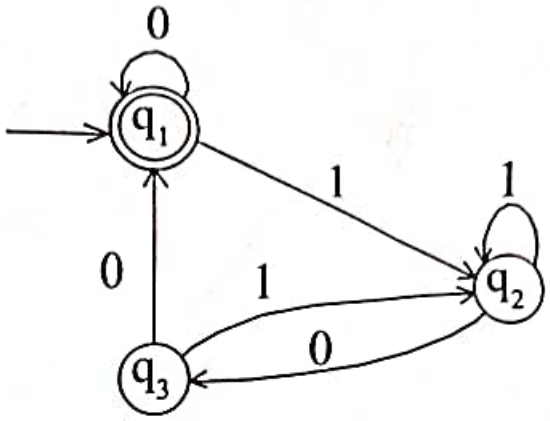
3. (a) Construct the finite automata equivalent to the regular expression $(0 + 1)^* (00 + 11)(0 + 1)^*$. 8

(b) Define Pumping Lemma for regular languages. Using pumping lemma show that $L = \{0^i 1^i \mid i >= 1\}$ is not regular. 8

4. (a) State and prove Arden's Theorem.

Solve $(1 + 00^*1) + (1 + 00^*1)(0 + 10^*1)^*(0 + 10^*1) = 0^*1(0 + 10^*1)^*$ using Arden's theorem. 8

(b) Construct a regular expression corresponding to the state diagram described by the following figure :



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SECTION—C

5. (a) Construct a reduced grammar equivalent to the grammar

$S \rightarrow aAa$, $A \rightarrow Sb \mid bCC \mid DaA$, $C \rightarrow abb \mid DD$, $E \rightarrow aC$, $D \rightarrow aDA$ 4

(b) Find Chomsky Normal Form (CNF) equivalent to :

$S \rightarrow aAbB$, $A \rightarrow aA \mid a$, $B \rightarrow bB \mid b$ 4

(c) Convert the Grammar $S \rightarrow AB$, $A \rightarrow BS \mid b$, $B \rightarrow SA \mid a$ into Greibach Normal Form (GNF). 8

6. (a) What is Parsing ? How is Top Down parsing done ? 4

(b) Differentiate between Deterministic and Non Deterministic PDA. 4

(c) Construct a PDA accepting $\{a^n b^m a^n \mid m, n \geq 1\}$ by null store. Construct the corresponding context free grammar accepting the same set. 8

SECTION—D

7. (a) Discuss properties of LR(k) grammar. 8

   (b) Construct a Turing Machine that can accept the set of all even palindromes over {0, 1}. Also construct a transition table and transition diagram of this TM. 8

8. (a) Discuss the Post Correspondence Problem and Universal Turing Machine. 8

   (b) Design a Turing Machine M to recognize the language $\{1^n2^n3^n \mid n \geq 1\}$. 8

SECTION—E

9. (i) If a regular grammar G is given by $S \rightarrow aS \mid a$. Find DFA accepting L(G).

   (ii) Write a CFG for the language $\{0^n\ 1^n \mid n \geq 1\}$.

   (iii) What are the limitations of FSM ?

   (iv) Differentiate between Grammar and Language.

   (v) Write regular expression to denote a language L which accepts all the strings that begin or end with either 00 or 11.

   (vi) $L = \{a^nb^{2n} \mid n >= 1\}$ is accepted by which type of machine and why ?

   (vii) What do you understand by TM with the stationary head ?

   (viii) Prove : If L1 and L2 are two regular languages then L1 U L2 is regular. 2×8=16