B.E. Sixth Semester (Information Technology) (CGS)

10742 : Theory of Computation : 6 IT 03

P. Pages : 3 | **AU - 2770**

Time : Three Hours | Max. Marks : 80

* 0 8 3 6 *

Notes : 1. Due credit will be given to neatness and adequate dimensions.
2. Assume suitable data wherever necessary.
3. Use of pen Blue/Black ink/refill only for writing the answer book.

1. a) Construct a deterministic finite automation equivalent to 7
$M=(\{q_0, q_1, q_2, q_3\}\ \{a, b\}\ \delta, q_0, \{q_3\})$ where δ is given by.

State/Σ	a	b
$\rightarrow q_0$	$\{q_0, q_1\}$	$\{q_0\}$
q_1	$\{q_2\}$	$\{q_1\}$
q_2	$\{q_3\}$	$\{q_3\}$
q_3	ϕ	$\{q_2\}$

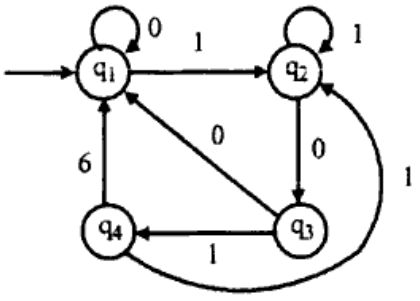
b) Find an NFA for the foll language L:{xε{a b}*:x contains a substring bb or substring bab} 6

OR

2. Draw the FA for the foll transition table and construct the minimum state automation equivalent to. 13

State/Σ	a	b
$\rightarrow q_0$	q_1	q_0
q_1	q_0	q_2
q_2	q_3	q_1
(q_3)	q_3	q_0
q_4	q_3	q_5
q_5	q_6	q_4
q_6	q_5	q_6
q_7	q_6	q_3

3. a) Construct a regular expression for the state diagram described by. 7



b) Using pumping lemma show that the following language is regular or not 6
$\alpha = \{ww \mid w \in \{a\ b\}^*\}$.

OR

4. a) Construct left linear and right linear grammars for the languages. 8
i) $(0+1)^*\ 00(0+1)^*$
ii) $0^*(1(0+1))^*$

b) Show that the following languages are not regular. 5
$\Sigma = \{a\ b\}$ $L = \left\{ww^R \mid w \in \Sigma^*\right\}$

5. a) Construct a PDA equivalent to the following grammar. 7
$S \rightarrow aAA$
$A \rightarrow aS \mid bS \mid a$

b) Convert the following grammar into CNF 7
$S \rightarrow abAB$
$A \rightarrow bAB \mid \in$
$B \rightarrow Baa \mid A \mid \in$

OR

6. a) Let G be the grammar 7
$S \rightarrow aB \mid bA$
$A \rightarrow a \mid aS \mid bAA$
$B \rightarrow b \mid bS \mid aBB$ for
The string bbaaba find a
i) Left most derivation
ii) Right most derivation
iii) Parse tree

b) Convert the following grammar to GNF form (Greibach Normal Form) 7
$S \rightarrow XY1 \mid 0$
$X \rightarrow 00X \mid Y$
$Y \rightarrow 1X1$

7. a) Design a Turing Machine that performs proper subtraction $M \dot{-} n$ defined to be m-n for $M \geq n$ and zero for $m<n$. 8

b) Explain what is a multi tape Turing machine and write its relation with one-way Turing Machine. 6

OR

8. a) Design a Turing Machine to compute the multiplication of two numbers. 8

b) Explain a Turing machine with two-way infinite tape and write its relation with the one-way infinite tape TM. 6

9. a) Find a CSG for the language. 7
$L=\{SS \mid S \in \{a\ b\}^*\}$.

b) Define LR(0) grammar show that grammar $G(\{S', S, A\}\ \{a, b, c\}\ P\ S')$ is LR(0) where the production are. 6
$S' \rightarrow SC\ \ S \rightarrow SA \mid A\ \ A \rightarrow aSb \mid ab$.

OR

10. a) Show that there exists some LBA M for every context sensitive language L such that L = L (M). 7

b) Show that $L=\{w \in \{a\ b\}^* \mid n_a(w) \neq n_b(w)\}$ is a deterministic context free language. Write DPDA for it. 6

11. a) What is a P(P) Determine whether the following (A, B) list have a PCP solution or not'? If yes give a solution if no why? 7

	List A	List B
i	W_i	x_i
1	001	01
2	0011	111
3	11	111
4	101	010

b) Prove that there is no TM that solves the halting problem. 6

OR

12. a) Prove that the union of two recursive languages is recursive and the union of two recursively enumerable languages is recursively enumerable. 7

b) Explain the halting problem of Turing machine. 6

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