Total No. of Questions :10] *[Total No. of Printed Pages :3*

Roll No .....

CS - 505

B.E. V Semester

Examination, December 2012

Theory of Computation

Time : Three Hours

Maximum Marks : 70/100

Note : *1. Attempt one question from each unit.*

2. All questions carry equal marks.

Unit - I

1. a) Construct an DFA accepting the set of all string over the alphabet {0, 1}, such that number of 0's divisible by 5and number of 1's divisible by 3.

   b) State and prove Myhill - Nerode theorem.

OR

2. a) Explain pumping lemma for regular sets. Also prove following set is not regular.

   $L = \{0^m 1^n 0^{m+n} \mid m \geq 1 \text{ and } n \geq 1$

   b) Convert the following Mealy machine into its equivalent Moore machine.

Present state	Next state			
	$a = 0$		$a = 1$	
	State	Output	State	Output
q_0	q_1	n	q_2	n
q_1	q_1	y	q_2	n
q_2	q_1	n	q_2	y

Unit - II

3. a) Convert the following Grammar into Greibach normal form.

$$S \rightarrow AA \mid 0$$
$$A \rightarrow SS \mid 1$$

b) Write CFG for set of all words consisting of an equal number of *a*'s and *b*'s.

For example: *a a b b*, *a b a b*, *a b b b a a*.

OR

4. a) Let G be the grammar.

$$S \rightarrow aB \mid bA$$
$$A \rightarrow a \mid aS \mid bAA$$
$$B \rightarrow b \mid bs \mid aBB$$

For the string *a a a b b a b b b a* find *a*

a) Left most Derivation

b) Right most Derivation

c) Parse tree

b) Convert the following CFG into CNF

$$S \rightarrow ABA$$
$$A \rightarrow aA \mid \in$$
$$B \rightarrow bB \mid \in$$

Unit - III

5. a) Construct PDA that accepts language

$$L = \{WW^R \mid W \text{ in } (0 + 1)^*$$

b) Give a grammar for language N(*m*) where

$$M = (\{q_0, q_1\}, \{0, 1\}, \{X, Z_0\}, \delta, q_0, z_0, \phi)$$

Where δ given by

$\delta(q_0, 0, z_0) = (q_0, XZ_0)$ $\delta(q_1, 1, X) = (q_1, \in)$

$\delta(q_0, 0, X) = (q_0, XX)$ $\delta(q_1, \in, X) = (q_1, \in)$

$\delta(q_0, 1, X) = (q_1, \in)$ $\delta(q_1, \in, Z_0) = (q_1, \in)$

OR

6. a) Explain pumping lemma for CFLS. Show that $L = \{a^n b^n c^n \mid n \geq 1\}$ is not *a* context free language.

   b) Construct a PDA equivalent to following grammar.

   $S \rightarrow aAA$

   $A \rightarrow as / bs / a$

Unit - IV

7. a) Design a turing machine to accept the language $L = \{0^n 1^n 0^n \mid n \geq 1\}$

   b) Explain properties of recursive and recursively enumerable languages.

OR

8. a) Design a Turing machine to compute factorial of a number.

   b) Explain Church's hypothesis.

Unit - V

9. a) Explain P, NP, NP complete problems with example.

   b) Write brief note on untractable problems.

OR

10. a) What is NP complete problems? Show that traveling sales man problem is NP complete.

    b) Explain vertex cover problem.

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