

Total No. of Questions : 8]

SEAT No. :

P1502

[5460]-181

[Total No. of Pages : 2

T.E.(Computer)

THEORY OF COMPUTATION

(2012 Pattern) (Semester - I) (End Semester) (310241)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer four questions.*
- 2) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data wherever required.*

Q1) a) Construct DFA for the following: **[6]**

- i) String having length at most 2.
- ii) Every "a" is followed by "b".
- iii) Set of all strings end with ab.

b) For the grammar given below, **[6]**

$E \rightarrow E+T|T$

$T \rightarrow T*F|F$

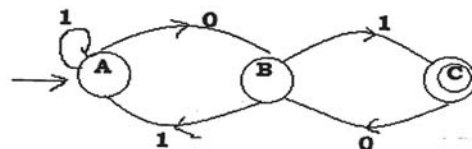
$F \rightarrow (E)|a|b$ give derivation of $(a+b)*(a+b)$

c) Define Pumping Lemma and prove that the language, $A = \{a^n b^n | n \geq 0\}$ is not regular **[8]**

OR

Q2) a) Construct a Moore machine that takes set of all string over $\{0,1\}$ and produces 'A' as output if input ends with '10' or produces 'B' as output if input ends with '11' otherwise produces 'C'. **[6]**

b) Make a use of Arden's theorem to determine the regular expression for the finite automata shown below. **[6]**



c) Define CFG? Construct a right linear grammar for the given left linear grammar, **[8]**

$S \rightarrow C0|A0|B1$

$A \rightarrow A1|C0|B1|0$

$B \rightarrow B1|1$

$C \rightarrow A0$

P.T.O.

- Q3)** a) What is Turing Machine? Give the formal definition of Turing machine? Design Turing machine for $a^n b^n c^n \mid n \geq 1$. [7]
 b) Write a short note on : [7]
 i) Universal Turing Machine.
 ii) Recursively Enumerable Language.
 c) Define Halting Problem of Turing Machine with suitable example? [4]

OR

- Q4)** a) Construct a Turing machine which accepts even numbers of 0's and odd number of 1's. [7]
 b) What are the different ways for extension of Turing machine? Construct the two tape Turing machine to convert an input W into WW^R . [7]
 c) What is Post Machine? Explain the formal definition of Post Machine. [4]

- Q5)** a) What is Non Deterministic Push Down Automata? Construct a NPDA for $WW^R \mid W \in (a, b)^+$ [8]
 b) Construct a PDA that accept a language $L = a^n b^{m+n} c^m \mid n, m \geq 1$. [8]

OR

- Q6)** a) What is Push Down Automata? Give a formal definition of PDA? What are the different ways to construct a PDA, Explain each with example? [8]
 b) Obtain CFG for the following Push Down Automata, [8]
 $\delta(q_0, 0, Z_0) \rightarrow (q_0, XZ_0)$
 $\delta(q_0, 0, X) \rightarrow (q_0, XX)$
 $\delta(q_0, 1, X) \rightarrow (q_1, \epsilon)$
 $\delta(q_1, 1, X) \rightarrow (q_1, \epsilon)$
 $\delta(q_1, \epsilon, X) \rightarrow (q_1, \epsilon)$
 $\delta(q_1, \epsilon, Z_0) \rightarrow (q_2, \epsilon)$

- Q7)** a) What is Clique Problem? Show that it is NP Complete Problem? [8]
 b) What do you mean by polynomial time reduction? Describe any problem in detail that is solvable through polynomial time reduction. [8]

OR

- Q8)** a) Write a short note on following: [8]
 i) Tractable and Intractable Problem.
 ii) SAT Problem.
 b) What do you mean by NP Problems? Justify Why Travelling Salesman problem is a NP-Problem? [8]

