Total No. of Questions :8]

SEAT No. :

P3529

[Total No. of Pages :2

[5560]-181
T.E. (Computer Engg)
THEORY OF COMPUTATION
(2012 Pattern) (Semester-I)

Time : 2½ Hours] *[Max. Marks : 70*

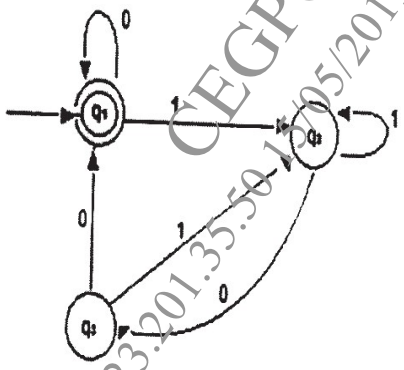
Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right Indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Determine the regular expression over the alphabets{a.b} for the following. **[6]**

1) All the strings containing exactly two a's
2) All the strings containing ab
3) All the strings starting with xx

b) Determine the regular expression for following finite automata using Arden's Theorem. **[8]**



c) Prove that (1+00*1)+(1+00*1)(0+10*1)*(0+10*1)=0*1(0+10*1). **[6]**

OR

Q2) a) Construct NFA for the regular expression b+ba* **[6]**

b) Prove by Mathematical Induction
$2^0+2^1+2^2+2^3+.....+2^n=2^{n+1}-1$ for all integers n>=0 **[6]**

c) Construct CFG for the language $L=\{0^i1^j2^k \mid j<k\}$ **[8]**

Q3) a) Convert the following CFG to chomskey's normal form (CNF) **[5]**
$S \rightarrow AB, A \rightarrow CA|^, B \rightarrow DB|^, C \rightarrow 011|1, D \rightarrow 01$

P.T.O.

b) Remove the ε productions from the CFG by preserving meaning of it. **[4]**

P={S $\rightarrow$ XYX, X $\rightarrow$ OX| ε, Y $\rightarrow$ 1Y| ε }

c) Write a short note on **[9]**
   a) Unrestricted Grammar
   b) CFG
   c) Derivation Graph

OR

Q4) a) Construct Finite Automata for **[8]**
- 01[((10*)+11*)+0]*1
- 1(1+10)*+10(0+01)*

b) Simplify the following Grammar **[10]**
- S $\rightarrow$ Ab, A $\rightarrow$ a, B $\rightarrow$ C | b, C $\rightarrow$ D, D $\rightarrow$ E, E $\rightarrow$ a
- S $\rightarrow$ 0A0 | 1B1 |BB, A $\rightarrow$ C, B $\rightarrow$ S|A, C $\rightarrow$ S} ε

Q5) a) What is post machine? Construct a post Machine for strings having odd length and 'a' as a center symbol over Σ (a,b). **[6]**

b) What is NPDA? Construct a NPDA for L={$a^i b^j c^k$ | i $\neq$ j or j $\neq$ k} **[10]**

OR

Q6) a) What do you mean by NP-Complete problems? List all the problems in the class and explain any one in detail. **[8]**

b) Why do we need to reduce the given problem to Np-complete problem?Explain with suitable example. **[8]**

Q7) a) What is SAT problem? Explain in detail. **[8]**

b) What are tractable and Intractable problems? Explain **[4]**

c) What is Computational Complexity? Explain. **[4]**

OR

Q8) a) Construct TM which accepts even palindrome strings over the Σ={a.b}. **[8]**

b) Explain travelling salesperson problem. **[8]**