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**MANIPAL INSTITUTE OF TECHNOLOGY**  
 (Constituent Institute of Manipal University)  
 MANIPAL-576104



**FIFTH SEMESTER B.E. (CSE) MAKE UP EXAMINATION JAN-2008**  
**SUBJECT: THEORY OF COMPUTATION (CSE-301)**  
**( REVISED CREDIT SYSTEM )**

TIME : 03 HOURS

MAX.MARKS : 50

**Instructions to Candidates**

- Answer ANY FIVE FULL questions.
- Missing data can be suitably assumed.

1A.

- (i) A path is said to be \_\_\_\_\_ if no vertex is repeated. (1)
- (ii) Show the Prefix and Suffix of the string  $w=abbab$  (1)
- (iii) Explain (a) Acceptor (b) Transducer (1)

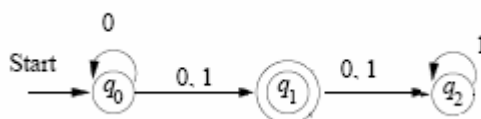
1B. Prove by induction that  $S_{n+1} = S_n + (n+1)$  where

$$S_n = \sum_{i=0}^n i = n(n+1) / 2 \quad (4)$$

1C. Draw the schematic diagram of general automation and explain all its important terms. (3)

2A. Show DFA which accepts any number of  $a$ 's followed by a string  $b,a$  and followed by strings  $a$ 's and  $b$ 's. (3)

2B. Convert NFA to an equivalent DFA. (4)



2C. Find an NFA which accepts the regular expression  $L ( r )$  where  $r = (a + bb)^* (ba^* + \lambda )$  (3)

3A. Find  $L1 / L2$  for  
 $L1 = L(a^*baa^*)$  and  $L2 = L(ab^*)$  (4)

3B. Show that  $L = \{ ww^R / w \in (0,1)^* \}$  is not regular using pumping lemma concept. (2)

3C. Show the CFG for the regular expression (4)

(i)  $(011 + 1)^* (01)^*$

(ii) Check for the ambiguity of the grammar

$S \rightarrow aB \mid bA$

$A \rightarrow aS \mid bAA \mid a$

$B \rightarrow bS \mid aBB \mid b$

4A. Simplify the following grammar (3)

$S \rightarrow aA \mid a \mid Bb \mid cC$

$A \rightarrow aB$

$B \rightarrow a \mid aA$

$C \rightarrow cCD$

$D \rightarrow ddd$

4B. Prove and state the theorem for Chomsky Normal Form. (3)

4C. Obtain a PDA to accept the language  
 $L(M) = \{ wCw^R / w \in (a,b)^* \}$  with ID. (4)

5A. Explain the conditions for DPDA. (2)

5B. Show PDA for the following grammar (4)

$S \rightarrow aA$

$A \rightarrow aABC \mid bB \mid a$

$B \rightarrow b$

$C \rightarrow c$

5C. State and prove the theorem that the family of CFL is closed under Union, Concatenation and Star Closure. (4)

6A. Give the definition for Turing Machine. (2)

6B. Design a TM that accepts  $L = \{ a^n b^n : n \geq 1 \}$  with ID. (5)

6C. Explain the TM with Stay Option. (3)

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