This question paper contains 4 printed pages]

Roll No. | | | | | | | | | | |

S. No. of Question Paper : 52

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Unique Paper Code : 32341502

Name of the Paper : Theory of Computation

Name of the Course : B.Sc. (H.) Computer Science

Semester : V

Maximum Marks : 75

Duration : 3 Hours

(Write your Roll No. on the top immediately on receipt of this question paper.)

Instructions for Candidates :

(1) All questions from Part A are compulsory. Attempt any *four* questions from Part B.

(2) Assume $\Sigma = \{a\ b\}$ is the underlying alphabet unless mentioned otherwise. Parts of a question must be answered together.

Part A

1. (*a*) Prove that for all sets S, $(S^+)^* = S^*$. 2

(*b*) Give regular expression for the language of all strings that do not end with double letter. 2

P.T.O.

(c) Show that (ab)*a and a(ba)* defines the same language over alphabet {a b}. 3

(d) Build an FA that accepts only those words that have exactly four letters. 4

(e) Build an FA that accepts only those words that do not end with ba. 4

(f) Find a CFG for the language Trailing count={$sa^{length(s)}$ for all s in (a+b)*}. 4

(g) Use the pumping lemma to show that the language Square={a^n where n is a square} is non-regular. 4

(h) Show that if L_1 and L_2 are regular language then so are L_1+L_2, L_1L_2 and L_1^*. 4

(i) Construct a PDA for the language L={$a^n b^{2n}$ n=0 1 2 3.....}. 4

(j) Design a right shifting turing machine. 4

Part B

2. (*a*) Define Regular Expression. 2

(*b*) Build a regular expression for all words that have odd no. of b's. 3

(*c*) Build an FA that accepts all strings that start and end with different letters. 5

3. (*a*) For languages, $L_1=(a+b)^*a$ and $L_2=(a+b)^*aa(a+b)^*$, find the deterministic finite automata for L_1+L_2. 6

(*b*) Show that the following context free grammar is ambiguous : 4

S–>aSb | Sb | Sa | a.

4. (*a*) Use the pumping lemma to show that the language a^nba^n where n=1 2 3 . . . is non-regular. 4

(*b*) For the given, $L_1=(a+b)^*a$ and $L_2=b(a+b)^*$, find the automata and regular expression for $L_1 \cap L_2$. 6

5. (*a*) Construct a PDA for the language $a^nb^ma^mb^n$ where m, n $\geq$ 1. 6

(*b*) Construct a CFG for the language $(ba+ab)^*$. 4

6. (*a*) Prove that a recursive language is also recursively enumerable. 6

(*b*) Using pumping lemma prove that the language $a^n b^n a^n b^n$ for n=1 2 3 ..... is non-context free. 4

7. (*a*) Design a turing machine for the language $a^n b^n c^n$ where n=1 2 3 6

(*b*) Describe "Universal Turing Machine". 4