'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

BCA Honours 5th Semester Examination, 2023

CC12-BACHELOR OF COMPUTER APPLICATION (52)

THEORY OF COMPUTATION

Time Allotted: 2 Hours | Full Marks: 60

The figures in the margin indicate full marks.
Answer all questions with internal choices.

GROUP-A

1. Answer any ***four*** questions: 3×4 = 12

   (a) When is a CFG said to be in GNF?

   (b) What is finite automata? Explain.

   (c) Define parse tree. Give an example.

   (d) Write the conditions for a pushdown automaton to be considered as deterministic.

   (e) Obtain a CFG to generate unequal number of a's and b's.

   (f) Draw a NFA for (a*+b*).(a+b)*

2. Answer any ***four*** questions: 6×4 = 24

   (a) State pumping lemma for context free grammar.

   (b) Explain Thompson's construction to convert a regular expression to NFA.

   (c) Convert the following Regular expression into FA: (a+b)*(aa+bb)(a+b)*.

   (d) Construct DFA for the following regular expression 10+(0+11)0*1.

   (e) Let *G* be the grammar

   $$S \to aB \mid bA,\ A \to a \mid aS \mid bAA,\ B \to b \mid bS \mid aBB$$

   For the string *aabbaabbba* find

   (i) leftmost derivation

   (ii) parse tree

   (iii) Is the grammar ambiguous?

   (f) State and explain the closure properties of regular languages.

3. Answer any ***two*** questions: 12×2 = 24

   (a) Using parse tree show that the grammar: $S \to S + S \mid S * S \mid a$ is ambiguous. Use $a + a * a$ as the string.

   (b) Explain Chomsky classification of languages in detail.

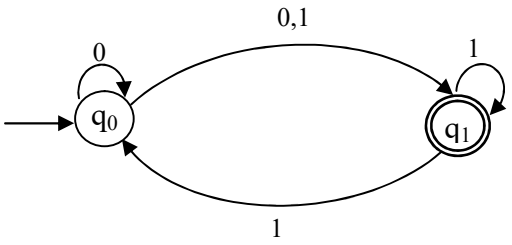
(c) Write short notes on any ***two***:

(i) Regular Expression

(ii) Universal Turing Machine

(iii) Recursive Languages.

(d) Convert the following NFA to its equivalent DFA (Show each step).



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