'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

BCA Honours 5th Semester Examination, 2021

CC12-BACHELOR OF COMPUTER APPLICATION (52)

THEORY OF COMPUTATION

Time Allotted: 2 Hours | Full Marks: 60

The figures in the margin indicate full marks.

GROUP-A

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

(a) What is regular expression? Explain different regular expression notations. 3

(b) What is finite automata? Explain. 3

(c) Write the differences between NFA and DFA. 3

(d) What do you mean by ε-closure? Why is it used? 3

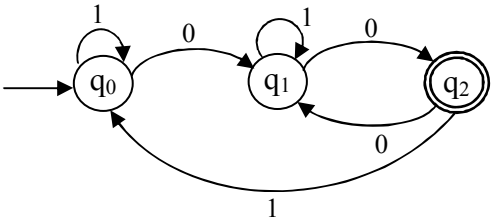
(e) Define parse tree. Give an example. 3

(f) Define grammar. Explain with an example. 3

GROUP-B

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

(a) Test whether the string 010010 and 01010 are accepted by the finite automata given in the following figure or not. 6



(b) Construct a DFA from the given NFA. 6

Present State	Next State	
	0	1
→ q_0	q_0, q_1	q_0
q_1	q_2	q_1
q_2	q_3	q_3
q_3	—	q_2

(c) State Arden's theorem and prove it. 6

(d) Explain Thompson's construction to convert a regular expression to NFA. 6

(e) Explain different types of grammar according to Chomsky's hierarchy. 6

(f) Write the Pumping lemma for regular expression. Show that 6

$L = \{a^n b^n \text{ where } n \geq 1\}$ is not regular.

GROUP-C

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

(a) Construct a minimized DFA that accepts all binary strings starts with a substring '00' and ends with '11'. 12

(b) Let G be a grammar 12

$$E \rightarrow E + T \mid T$$
$$T \rightarrow T * F \mid F$$
$$F \rightarrow (E) \mid a$$

Now construct (i) leftmost derivation (ii) rightmost derivation and (iii) parse tree of the following sentence

$$W : (a + a * a) * (a + a)$$

(c) (i) When is a grammar called left recursive? How to remove left recursion from a grammar? Explain with an example. 6+6 = 12

(ii) Construct a regular grammar 'G' generating the regular set

$$r = 01^* (0+1)^*$$

(d) Write short notes on any ***two*** of the following: 6×2 = 12

(i) Turing machine

(ii) Push down automata

(iii) Equivalence of Two Finite Automata

(iv) Ambiguity in context-free grammar.

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