'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2021

CC12-COMPUTER SCIENCE (52)

THEORY OF COMPUTATION

Time Allotted: 2 Hours | Full Marks: 60

The figures in the margin indicate full marks.
All symbols are of usual significance.

GROUP-A

Answer any *four* questions from the following 3×4 = 12

1. Describe the difference between the languages described by the following two regular expressions: 3
   (a) a^*b^* (b) $(ab)^*$

2. What is CFG? Give an example. 3

3. Differentiate between NFA and DFA. 3

4. Construct the NFA that accepts the language generated by the R.E. 3
   $ab*aa + bba*ab$

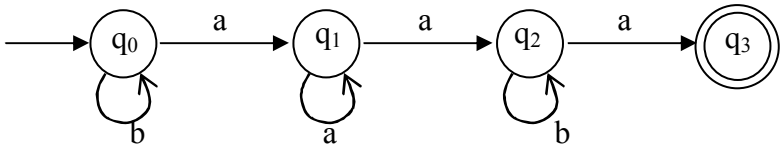
5. Test the grammar for ambiguity. 3
   $S \rightarrow AB$
   $A \rightarrow aA \mid \epsilon$
   $B \rightarrow ab \mid bB \mid \epsilon$

6. Find the equivalent CFG with no useless symbols 3
   $S \rightarrow ABC \mid BaB$
   $B \rightarrow bBb \mid a$
   $A \rightarrow aA \mid BaC \mid aaa$
   $C \rightarrow CA \mid AC$

GROUP-B

Answer any *four* questions from the following 6×4 = 24

7. Find the regular expression for the language accepted by the following automata



8. Construct the DFA for the following grammar: 6

$S \rightarrow abS \mid a$

9. Let G be a grammar: 6

$S \rightarrow aAS \mid a$

$A \rightarrow SbA \mid SS \mid ba$

Derive a string "aabbaa" using left most and right most derivations.

10. Let a grammar G be 6

$S \rightarrow bA \mid aB$

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

$B \rightarrow aBB \mid bs \mid b$

convert this grammar to CNF.

11. Design a PDA for the language $a^n b^n$. 6

12. Write a short note on Turing Machine. 6

GROUP-C

Answer any *two* questions from the following 12×2 = 24

13. Write an algorithm to convert regular expression to finite automata. Using your algorithm convert the following RE to equivalent NFA. 12

$r = (a \mid b) * (a \mid b)ab$

14. Define grammar. Explain different types of grammar with proper examples. 12

15. Write an algorithm to minimize the number of states of a DFA. Find the minimized DFA of the RE, 12

r = (0 | 11)*100

16. Write short notes on the following: 6×2 = 12

(a) Push Down Automata

(b) Regular expression.

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