

Department of Computer Science and Engineering
University of Liberal Arts Bangladesh
Final Examination (Summer 2020)
Course: Automata and Theory of Computation (CSE 417)
Section: 2 --- Duration: 2 Hours

PLEASE ANSWER ALL QUESTIONS.

Total 25 Marks

QUESTION 1

(2+3=5 Marks)

- a) What is minimal DFA?
- b) Design the DFA that accepts the strings that start and end with the same symbol. Assume that, $\Sigma = \{a, b\}$.

QUESTION 2

(1+1+2+2+2=8 Marks)

- a) Construct the Regular Expression (RE) that accepts the binary equivalent of even numbers.
- b) Construct another RE that does the same for odd numbers.
- c) Let's name them R1 and R2. Design the NFA for $RE = R1 \mid R2$.
- d) Convert the NFA to DFA.
- e) Minimize the DFA.

QUESTION 3

(1+3+4=8 Marks)

- a) Both the Pushdown Automata (PDA) and Turing Machine (TM) have a tape. Explain the key difference between these two types of tapes.
- b) The Context Free Grammar (CFG) for a binary string that is also an even palindrome is:
 $S \rightarrow 0S0 \mid 1S1 \mid \epsilon$. Generate the string "101101" using parse tree.
- c) Construct the PDA for the above CFG.

QUESTION 4

(2+2=4 Marks)

- a) Suppose you have a binary number as a string. Write an algorithm that will increment the decimal value of the number by 1.
- b) Design a Turing Machine that implements your algorithm.

****END OF QUESTIONS****