National University of Computer and Emerging Sciences

Lahore Campus

Theory of Automata (CS3005)

Date: April 4th 2024

Course Instructor(s)

Mr. Fraz Yousaf

Sessional-II Exam

Total Time (Hrs): 1

Total Marks: 25

Total Questions: 3

_____ _____ _____

Roll No Section Student Signature

Do not write below this line.

Attempt all the questions.

CLO #2: Differentiate and manipulate formal descriptions of languages, automata, and grammars. with focus on non-regular and regular using automata (DFA, NFA, NFA-NULL).

Q1: Is the following language regular or nonregular? Give a proper proof. [7 marks]

$$L = \{a0b \mid a \in \{0,1\}^*, b \in \{0,1\}^*, |a| = |b|\}$$

CLO #3: Differentiate and manipulate formal descriptions of languages, automata and grammars with focus on context-free languages using automata (PDA and NPDA).

Q2: Develop a PDA for the following language. [10 marks]

$$L= \{x \in \{a,b\}* \mid na(x) < nb(x)\}$$

Note: Please be neat in drawing PDA. No marks if it is not readable.
Hint: Not more than 4 States

CLO #3: Differentiate and manipulate formal descriptions of languages, automata and grammars with focus on context-free languages using automata (PDA and NPDA).

Q3: Apply CYK algorithm to tell whether the string x=abba is acceptable by the following grammar [8 marks]

S→ AB | BC
A→ BA | a
B→ CC | b | CS
C→ AB | C |a