Mahindra University Hyderabad

École Centrale School of Engineering

Minor-II exam

Program: B. Tech. **Branch: CSE , AI, CAM, ECE,CM** **Year: II** **Semester: II**

Subject: Theory of Computation (CS2204)

Date: 16-04-2025 **Start Time: 2:00 PM**

Time Duration: 1.5 Hours **Max. Marks: 50**

Instructions:

1) **All parts of a question should be answered consecutively.**
2) **Any question attempted using pencil will not be considered for the evaluation.**
3) **Mobile phones and computers of any kind should not be brought inside the exam hall.**
4) **Use of any unfair means will result in severe disciplinary action.**

Q1. **[2*5=10M]**

Let L be the language over the alphabet $\Sigma = \{0,1\}$ defined as:

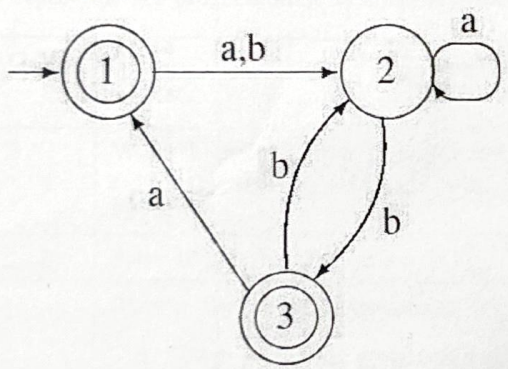
$L = \{ w \in \Sigma^* \mid w$ contains at least one occurrence of "01" and does not end with "11" $\}$

1.1 Construct a regular expression that generates L.

1.2 Convert the obtained regular expression from Q.1.1 to an equivalent NFA.

Q2. **[2*5=10M]**

2.1. Convert the following three-state Automaton to Regular Expression using G-NFA method. The order of selection of qrip (states to be eliminated) is 2, 3, 1.



2.2. Use Arden's Theorem to find the regular expression corresponding to the following transition equations of an automaton:

$R1 = aR1 + bR2 + \varepsilon$

$R2 = cR1$

Q3. **[2*5=10M]**

3.1. Design the right linear grammar over {a,b} that is having a minimum of substring ab. Convert the right linear grammar into equivalent left linear grammar.

3.2. Let $L = \{(10)^p 1^q : p, q \in N, p \geq q\}$. Prove that L is not regular using pumping Lemma.

Q4. [2*5=10M]

4.1. For the following grammars and string s, give (i) a parse tree (ii) a left-most derivation, and (iii) a right-most derivation. String **s = aacdb**

S := A B
A := a A
A := c
B := B b
B := d

4.2. Check if the given grammar is ambiguous or unambiguous for String **s = a + - a ** a**

S := E
E := E + T
E := T
T := T * F
T := F
F := - F
F := F1
F1 := F2 ** F1
F1 := F2
F2 := a

Q5. [2*5=10M]

5.1. Find a Chomsky Normal Form of CFG

$S \rightarrow aXbY$, $X \rightarrow aX \mid \varepsilon$, $Y \rightarrow bY \mid \varepsilon$

5.2. Covert the given grammar G into Griebach Normal Form.

$G = (\{A_1, A_2, A_3\}, \{a, b\}, R, A_1)$

$R = \{A_1 \rightarrow A_2A_3, A_2 \rightarrow A_3A_1|b, A_3 \rightarrow A_1A_2|a\}$

******ALL THE BEST******