Mahindra University Hyderabad

École Centrale School of Engineering

Minor exam

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

Subject: Theory of Computing (CS 2204)

Date: 20-04-2022 **Start Time: 9.00 AM**

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

Instructions:

1) All the questions are compulsory.

2) Be brief and to the point.

3) In case of doubt, make necessary assumptions and state them clearly.

Question 1: **5+5=10 marks**

a. Build a DFA which recognizes the language $L = \Sigma^*$ over $\Sigma = \{a,b\}$.

b. Give its formal description.

Question 2: **4*5=20 marks**

a. Build a DFA for the language $L_1=\{w \mid w \text{ has even length}\}$ over $\Sigma = \{a,b\}$

b. Build a DFA for the language $L_2=\{w \mid w \text{ has at least one b}\}$ over $\Sigma = \{a,b\}$

c. Combine the DFA's in part a and b to build a DFA which accepts both L_1 and L_2.

d. Build an NFA that recognizes L_2^* i.e., the star of L_2 (from 2b).

Question 3:

5+5=10 marks

a. Build an NFA with only three states that recognizes the language $0^*1^*0^+$.

b. Convert this NFA to DFA.

Question 4: **5*1=5 marks**

Give the regular expressions for the following languages over $\Sigma = \{0,1\}$

a. $\{w \mid w$ contains at least two 1's$\}$

b. $\{w \mid w$ starts and ends with a 1$\}$

c. $\{w \mid$ every even position of w is a 0$\}$

d. $\{w \mid w$ has a substring 101$\}$

e. All strings except the empty string

Question 5: **5 marks**

Convert the regular expression (10 U ((11)*(00)))* to NFA.