

Nirma University

Institute of Technology

Semester End Examination, May 2021

B.Tech in Computer Science and Engineering

Semester-VI

2CS601 THEORY OF COMPUTATION

Roll /
Exam No.

Supervisor's initial
with date

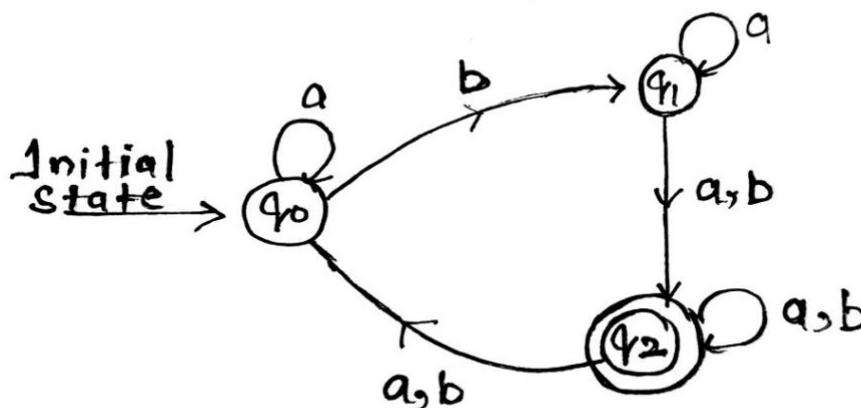
Time: 1 Hour and 30 minutes

Max. Marks : 40

Instructions:

1. Attempt all questions.
2. Figures to right indicate full marks.
3. Draw neat sketches wherever necessary.
4. Assume suitable data wherever necessary and mention the same.

- Q-1. Prove that: "Every non-zero rational number can be expressed as a product of two irrational numbers." [5]
- Q-2. Draw a DFA that accepts the language which contains at least one "a" and at least two "b" on input symbol {a, b}. Also give the regular expression for the same language. [5]
- Q-3. Convert the following NFA into DFA using Subset Construction Method. Explain all the steps clearly and draw the final DFA. [5]



OR

- Q-3. Define Pumping lemma for regular language and prove that the language $a^n b^{2n}$ is not regular using the same. [5]

Q-4 Write Context Free Grammar for the given language:

[5]

- a. $L = \{a^i b^j c^k \mid j > i + k\}$
- b. $L = \{a^i b^j \mid i \leq 2j\}$

OR

Q-4 Convert the given Context Free Grammar to Chomsky Normal Form. (Λ indicates null). [5]

$S \rightarrow AaA \mid CA \mid BaB$
 $A \rightarrow aaBa \mid CDA \mid aa \mid DC$
 $B \rightarrow bB \mid bAB \mid bb \mid aS$
 $C \rightarrow Ca \mid bC \mid D$
 $D \rightarrow bD \mid \Lambda$

Q-5 Convert the following PDA to CFG [10]

$\delta(q_0, a, Z_0) \mid - (q_0, aZ_0)$
 $\delta(q_0, a, a) \mid - (q_0, aa)$
 $\delta(q_0, c, a) \mid - (q_1, a)$
 $\delta(q_1, a, a) \mid - (q_2, \Lambda)$
 $\delta(q_2, a, a) \mid - (q_2, \Lambda)$
 $\delta(q_2, \Lambda, Z_0) \mid - (q_2, \Lambda)$

Q-6 Design a Turing Machine to accept the language of odd length and even length palindrome. Trace the strings: ababa, abbb, abbbba [10]
