

**End Term Assessment – Jan /Feb 2022**

**UG : Semester – V**

**(B.Tech-CSE/Data Science and Artificial Intelligence/Cloud based Mobile Application/Blockchain and IOT/Development and Operations - 2019 Batch)**

**Subject Code: CS3005**

**Subject Name: Theory of Computation**

**Duration: 3 hours (including time for uploading)    Max. Marks: 50**

**Instructions**

- Write name and registration number, page number, on all the pages, convert into one PDF, tag it with your Registration Number\_Name\_SubjectCode\_SubjectTitle
- The Assessment consists of 2 sections
  - Part A contains 10 questions of 2 marks each and all questions are compulsory.
  - Part B consists of 4 questions of 10 marks each, 3 questions out of 4 to be attempted
- Hand written responses to be submitted/uploaded as scanned pages of answer sheets (max. 5 pages) within the mentioned duration. 6<sup>th</sup> page and onwards won't be evaluated

**PART – A**

**2 \* 10 =20 Marks (Each answer- Word Limit- 50 Words)**

1. Prove that  $(1+00^*1)+(1+00^*1)(0+10^*1)^*(0+10^*1) = 0^*1(0+10^*1)^*$ .
2. What is the compliment of the language accepted by given  $\epsilon$ -NFA?

1. $Q \cup \Sigma$	2. 1	3. E
4. $\rightarrow q_0$	5. $q_1$	6. $\emptyset$
7. $*q_1$	8. $\emptyset$	9. $q_2$
10. $q_2$	11. $\emptyset$	12. $q_0$

3. Consider the following language  $L_1 = \phi$  and  $L_2 = \{b\}$ . Find the following represents  $((L_1 L_2^*) \cup L_1^*)$ .
4. Differentiate Moore and Mealy Machine.
5. Consider the production rules:  $S \rightarrow AB, A \rightarrow BC \mid a, B \rightarrow CC \mid b, C \rightarrow a$ . Check the finiteness of language generated by this grammar.
6. Consider the following grammar and remove left recursion  $S \rightarrow Aa \mid b, A \rightarrow Ac \mid Sd \mid \epsilon$
7. Consider  $L_1$  is context-free language and  $L_2$  is a regular language. Justify that  $L_1 \cup L_2$  is regular language or not?
8. Design a PDA equivalent to the following grammar  $S \rightarrow aAA, A \rightarrow aS \mid bS \mid a$ .
9. Define Turing Machine.
10. What is recursive language?

**PART – B**

**10\*3 = 30 Mark (Each answer- Word limit- 250 words)**

11. Construct a transition graph that recognizes the set. (10 Marks)

$$R = [1 \cdot (00)^* \cdot 1 + 0 \cdot 1^* \cdot 0]^*$$

12. Construct a DFA equivalent to the given  $\epsilon$ -NFA. (10 Marks)

State / Input	a	B	$\epsilon$
$\rightarrow Q_0$	$Q_0$	$\{Q_0, Q_2\}$	$Q_3$
$Q_1$	$Q_3$	$\{Q_2, Q_3\}$	$\emptyset$
$Q_2$	$Q_4$	$\emptyset$	$\emptyset$
$*Q_3$	$Q_4$	$\emptyset$	$Q_1$
$*Q_4$	$\emptyset$	$\emptyset$	$\emptyset$

13. Consider the Grammar  $G = (\{A_1, A_2, A_3\}, \{a, b\}, P, A_1)$  where P consists of  $A_1 \rightarrow A_2A_3, A_2 \rightarrow A_3A_1|b, A_3 \rightarrow A_1A_2|a$ . Convert G into Greibach normal form (GNF). (10 Marks)

14. i. Convert the following grammar  $S \rightarrow 0S1 | A, A \rightarrow 1A0 | S | \epsilon$  to a PDA that accept the same language. (05 Marks)

ii. State and prove Rice's theorem. (05 Marks)