TEZPUR UNIVERSITY

Test III (Assignment), 2019

CO205 : Formal Languages and Automata

(*Please carefully read the complete document before attempting the questions*)

There are two questions in the assignment as follows. Figures on the right indicate full marks for the questions:

1. Design a DFA for a regular language L_1 and write a program to simulate the DFA. The program should be able to take any random string as input from the user and determine whether the string belongs to the language L_1. [10]
2. Design a PDA for a context free language L_2 and write a program to simulate the PDA. Similar to the previous question, the program should be able to determine whether a random string given as user input belongs to the language L_2. [15]

Each student will work on a different set of languages (L_1 and L_2). The roll number-wise allocation of languages L_1 and L_2 are given in the table below:

Roll Numbers	**Assigned set**	
1 11 21 31 41 51 61 71	Set 1	$L_1 = \{w \mid w \text{ has at least two } 1's\}$ $\Sigma_1 = \{0, 1, 2\}$ $L_2 = \{w \mid w \text{ has same number of } 0's \text{ and } 1's\}$, $\Sigma_2 = \{0, 1\}$
2 12 22 32 42 52 62 72	Set 2	$L_1 = \{w \mid w \text{ has the substring } 010\}$ $\Sigma_1 = \{0, 1\}$ $L_2 = \{w \mid w \text{ starts and ends with the same symbol}\}$ $\Sigma_2 = \{0, 1\}$
3 13 23 33 43 53 63 73	Set 3	$L_1 = \{w \mid w \text{ has even number of } 1's\}$ $\Sigma_1 = \{0, 1\}$ $L_2 = \{0^n 1^m 0^n \mid n \geq 1, m \geq 1\}$ $\Sigma_2 = \{0, 1\}$
4 14 24 34 44 54 64 74	Set 4	$L_1 = \{w \mid \text{the number of } 0's \text{ in } w \text{ is a multiple of } 3\}$ $\Sigma_1 = \{0, 1\}$ $L_2 = \{0^n 1^n 2^m \mid n \geq 1, m \geq 1\}$ $\Sigma_2 = \{0, 1, 2\}$
5 15 25 35 45 55 65 75	Set 5	$L_1 = \{w \mid \text{the length of } w \% 3 = 1\}$ $\Sigma_1 = \{a, b, c\}$ $L_2 = \{w \mid \text{the length of } w \text{ is odd and the middle symbol is } 0\}$ $\Sigma_2 = \{0, 1\}$

6	16	26	36	46	56	66	76	Set 6	$L_1 = \{w \mid w \text{ ends with the substring } bb\}$ $\Sigma_1 = \{a, b\}$ $L_2 = \{0^n w \mid n \geq 1, w \in \{0,1\}^* \text{ and } \lvert w \rvert = n\}$ $\Sigma_2 = \{0, 1\}$
7	17	27	37	47	57	67	77	Set 7	$L_1 = \{w \mid w \text{ does not end with } a\}$ $\Sigma_1 = \{a, b, c\}$ $L_2 = \{w0^n \mid n \geq 1, w \in \{1,2\}^* \text{ and } \lvert w \rvert = n\}$ $\Sigma_2 = \{0, 1, 2\}$
8	18	28	38	48	58	68	78	Set 8	$L_1 = \{w \mid w \text{ begins with the substring } aba\}$ $\Sigma_1 = \{a, b\}$ $L_2 = \{O^j 1^k 2^{j+k} \mid j \geq 1, k \geq 1\}$ $\Sigma_2 = \{0, 1, 2\}$
9	19	29	39	49	59	69		Set 9	$L_1 = \{w \mid \text{the number of } a's \text{ in } w \% 3 \text{ is } 1\}$ $\Sigma_1 = \{a, b\}$ $L_2 = \{a^i b^j \mid i \geq 1, \quad j > i\}$ $\Sigma_2 = \{0, 1\}$
10	20	30	40	50	60	70		Set 10	$L_1 = \{w \mid w \text{ has at least } 3\ b's\}$ $\Sigma_1 = \{a, b, c\}$ $L_2 = \{a^i b^j \mid i \geq 1, \quad j = 2 * i\}$ $\Sigma_2 = \{0, 1\}$

Submission details:

1. The state diagrams of the DFA and PDA need not be submitted separately. However, the states and the transitions should be clearly mentioned within the program itself (as comments etc).
2. The programs can be written in C, C++, or Python. Clearly state your roll number as a comment at the beginning of the program file.
3. Rename the program file using your roll number, set number, and question number. For example *CSB17001_Set1_Q1.c* and *CSB17001_Set1_Q2.c*
4. Please submit the assignments via Google Classroom.
5. The last date for submissions is **11:59PM, 21 April 2019 (Sunday)**.
    - Late submissions will be subject to **negative marking**.
    - If the submission is made k days after the last date, then the marks to be awarded will be calculated as, $X_k = X - \frac{k(k-1)}{2}$. Here, X is the actual marks based on the evaluation.