

Course Code: CS301	Course Name: Theory of Automata
Instructor Name: Muhammad Shahzad	
Student Roll No:	Section No:

Instructions:

- Return the question paper.
- Read each question completely before answering it. There are **5 questions and 2 pages**.
- In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.
- All the answers must be solved according to the sequence given in the question paper.

Time: 60 minutes.

Max Marks: 50 points

Question 1: Select the best answer and write either A, B, C or D from the options given below each statement: [10]

1) $(a^* + b^*)^* = (a + b)^*$ this expression is _____ A. True B. False	6) What do automata mean? A. Something done manually B. Something done automatically
2) Alphabet $S = \{a, Bc, cC\}$ has _____ number of letters A. 1 B. 2 C. 3	7) If $S = \{x\}$, then S^* will be A. $\{x, xx, xxx, xxxx, \dots\}$ B. $\{\wedge, x, xx, xxx, xxxx, \dots\}$
3) If $S = \{aa, bb\}$, then S^* will not contain A. aabbaa B. bbaabbbb C. aaabbb D. aabbaaaa	8) language can be expressed by more than one FA". This statement is _____ A. True B. False C. Sometimes true & sometimes false D. None of these
4) $(a+\lambda)^*b + \lambda$ is equivalent to: A. $(a+b)a^*b$ B. $(a+b)a^*b + \lambda$ C. $(a+b)a^*ab + \lambda$ D. none of these	9) $(aa+bb)^*$ is equivalent to: A. $(aa+ab)^*$ B. $(b^*aaab^*)^*$ C. $(aa+a+b)^*$ D. None of these
5) $(b+ab)^*(a + \lambda)$ is equivalent to: A. $b^*(abb^*)^* + b^*(abb^*)^*a$ B. $b^*(ab^*)^*(a + \lambda)$ C. $b^*(abb^*)^*$ D. none of these	10) In an FA, when there is no path starting from initial state and ending in final state then that FA A. accept null string B. accept all strings C. accept all non empty strings D. does not accept any string

Question 2: Write REs of the following:

[10]

- A. Set of all string having substring 00
- B. The language of all strings over the alphabet $\{a, b\}$ that contain exactly two a's.
- C. Set of all string end with 01
- D. The language, defined over $G = \{a, b\}$, of words starting with double a and ending in double b
- E. Strings not containing the substring 110.

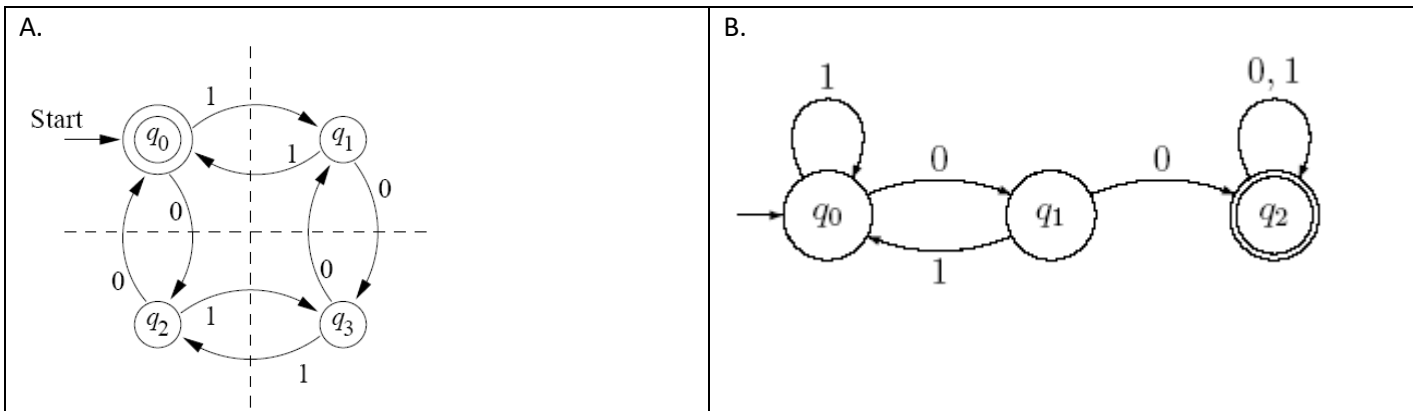
Question 3: Draw FA of the following REs:

[10]

- A. $(0+1)^*00$
- B. $a(ab)^*aa$
- C. $a+b + a(a+b)^*a + b(a+b)^*b$
- D. $(0+1)^*111(0+1)^*$

Question 4: Write the language that is accepted by each of the following:

[10]



Question 5: Give the recursive definition of following languages:

[10]

- A. "number multiple of three" $L = \{3, 6, 9, 12, \dots\}$
- B. The language PALINDROME, defined over $\Sigma = \{a, b\}$
- C. The language L, of strings containing exactly aa, defined over $\Sigma = \{a, b\}$
- D. The language $\{anbn\}$, $n=1,2,3,\dots$, of strings defined over $\Sigma = \{a, b\}$