

Department of Computer Science & IT  
The Islamia University of Bahawalpur

MCS -3<sup>rd</sup> (Morning) - Mid Term  
Midterm - 06 April. 2017  
Instructor: Dr. Nadeem Akhtar

Subject: Theory of Automata and Formal Languages (CSIT-21304)  
Time: 80 min.  
(Marks: 30)

**Q1. Short questions**

- a) Differentiate between Finite Automata and Regular Languages. Give an example.
- b) Differentiate between Finite Automata and Regular Expression. Give an example.
- c) Differentiate between the transition function of DFA and NFA. Give examples.
- d)  $\Sigma = \{a, b\}$ . Construct FA for the following language

$\{ w \mid w \text{ contains the substring } abab, \text{ i.e., } w = xababy \text{ for some } x \text{ and } y \}$

- e)  $\Sigma = \{0, 1\}$ . Construct FA for the language  $1^*01^+$

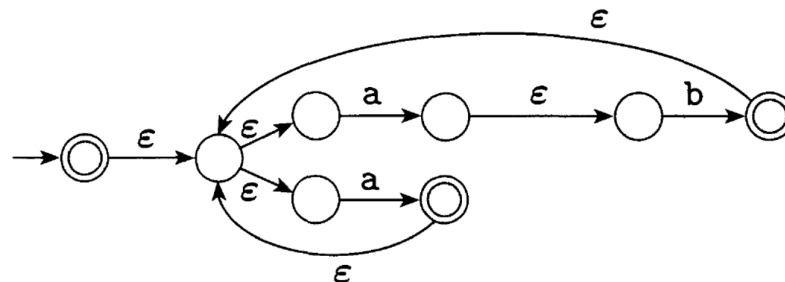
( 2 + 2 + 2 + 2 + 2 = 10 )

**Q2. Write the Regular languages generated by the following Regular expressions. Also construct the Finite Automata that recognize the regular languages generated by the following Regular Expressions.**  
(Note: The alphabet  $\Sigma = \{a, b\}$  )

- a)  $ba^* \cup ab^*$
- b)  $(ab)^* \cup aba$
- c)  $b(\Sigma\Sigma)^+ a$
- d)  $(a \cup ba \cup bb)$

( 4 + 4 + 4 + 4 = 16 )

**Q3. The following is the state diagram of a Finite Automaton M**  
[where alphabet  $\Sigma = \{a, b\}$  ]



- a) Give the complete formal description of machine M
- b) Does the machine M accept the string aaababa?
- c) Define the Regular language recognized by the above Finite Automaton M.

( 2 + 1 + 1 = 4 )