

**Department of Computer Science & IT**  
**The Islamia University of Bahawalpur**

**MCS -3<sup>rd</sup> (Evening) - 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

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

$$\{w \mid w \text{ has even length and an odd number of a's}\}$$

- e)  $\Sigma = \{0, 1\}$ . Construct FA for the language  $1^*(001^+)^*$

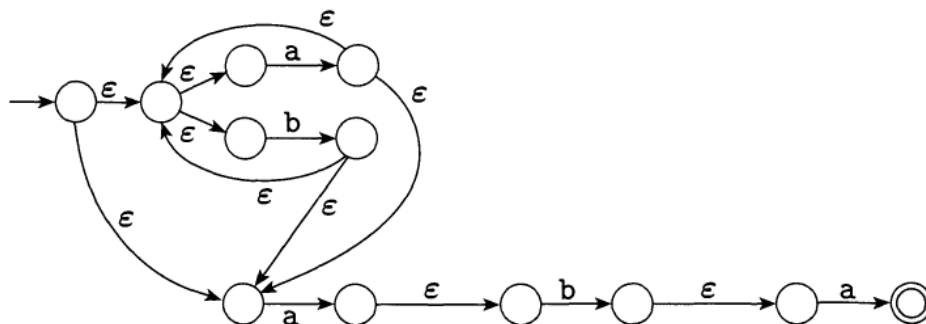
**( 2 + 2 + 2 + 2 + 2 = 10 )**

**Q2. Describe the Regular languages denoted 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)  $(a \cup ba \cup bb)\Sigma^*$

**( 4 + 4 + 4 + 4 = 16 )**

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



- Give the complete formal description of machine **M**
- Does the machine **M** accept the string aabbbbaba?
- Define the Regular language recognized by the above Finite Automaton **M**.

**( 2 + 1 + 1 = 4 )**