

Department of Computer Science & IT  
The Islamia University of Bahawalpur

MCS –3<sup>rd</sup>  
Midterm – 07 April 2016  
Instructor: Dr. Nadeem Akhtar

Subject: Theory of Automata and Formal Languages  
Time: (1 hr 30 mins.) 90 mins.  
(Marks: 30)

<p><b>Q1. Short questions</b></p> <p>a) Differentiate between a <i>Set</i> and <i>Sequence</i>. Give an example</p> <p>b) Define Regular Language. Write Regular Operations.</p> <p>c) Differentiate between the transition function of DFA and NFA. Give example</p>	(06)
<p><b>Q2. Describe the languages denoted by the following Regular expressions:</b> (Note: The alphabet <math>\Sigma = \{a, b\}</math> )</p> <p>a) <math>(a \Sigma^*) \cup (\Sigma^* b)</math></p> <p>b) <math>b^* (ab^+)^*</math></p> <p>c) <math>aaa(\Sigma\Sigma)^*</math></p> <p>d) <math>(a \cup \epsilon) b^*</math></p>	(08)
<p><b>Q3. a) Describe the language denoted by the following regular expression.</b> <math>(\Sigma = \{0, 1\})</math> <math>0^*1 \cup 1^*0</math></p> <p>Also construct Finite Automata that recognizes this language</p> <p>b) Prove that the class of regular languages is closed under the concatenation operation. Give an example.</p>	<p>4</p> <p>4</p> <p>(08)</p>
<p><b>Q4. The alphabet <math>\Sigma = \{a, b\}</math>.The following is the state diagram of a Finite Automaton M</b></p> <div><pre>graph LR     start(( )) --&gt; q0(((q0)))     q0 -- a --&gt; q1((q1))     q1 -- a --&gt; q4((q4))     q1 -- a --&gt; q5(((q5)))     q1 -- b --&gt; q2((q2))     q2 -- ε --&gt; q3((q3))     q3 -- ε --&gt; q0     style start fill:none,stroke:none</pre></div> <p>a) Give the complete formal description of machine M.</p> <p>b) Describe the language accepted by Finite Automaton M.</p> <p>c) What sequence of states does the machine go through on input abababaa?</p>	<p>3</p> <p>3</p> <p>2</p> <p>(08)</p>