

# TABLE OF SPECIFICATIONS FOR EXAM QUESTIONS

University of Liberal Arts Bangladesh

Department: Computer Science and Engineering (CSE)

Midterm Examinations, Semester: Summer 2020

Program: B.Sc. in CSE

Course Code: CSE417

Course Title: Automata and Theory of Computation

Credit Hr: 3

Time: 1 Hours

Total Marks: 25

Name & Designation of the Examiner: Satyaki Das, Lecturer

## Learning Outcomes (LO):

1. <b>Describe</b> the principles and concept of automata along with its benefits.
2. <b>Explain</b> features of state machines to design and develop solutions
3. <b>Solve</b> a wide range of practical problems for automata and formal languages.
4. <b>Understand</b> real-life problem and <b>be able</b> to design the solution using automata.
5. <b>Design and develop</b> solutions to real-life problems.

## Levels in Bloom's Cognitive Domain:

C1: Remember

C2: Understand

C3: Apply

C4: Analyze

C5: Evaluate

C6: Create

Question No.	Learning Outcomes (CO)	Level in Bloom's Cognitive Domain along with Allocation of Marks					
		C1	C2	C3	C4	C5	C6
1	1, 2	2	3				
2	1, 2			3	2		
3	1, 2, 3	1	2		4		
4	1, 2, 3	1	2	5			
Total Allocation of Marks	25	4	7	8	6		

Question No.		Learning Outcome					
		CO1	CO2	CO3	CO4	CO5	CO6
1		3	2				
2		3	2				
3		1	2	4			
4		1	2	5			
Total Allocation of Marks	25	8	8	9			



Signature of the Examiner

Date: 12.08.2020

**Department of Computer Science and Engineering**  
**University of Liberal Arts Bangladesh**  
**Mid-Term Examination (Summer 2020)**  
**Course: Automata and Theory of Computation (CSE 417)**  
**Section: 2 --- Duration: 1 Hour**

**PLEASE ANSWER ALL QUESTIONS.**

**Total 25 Marks**

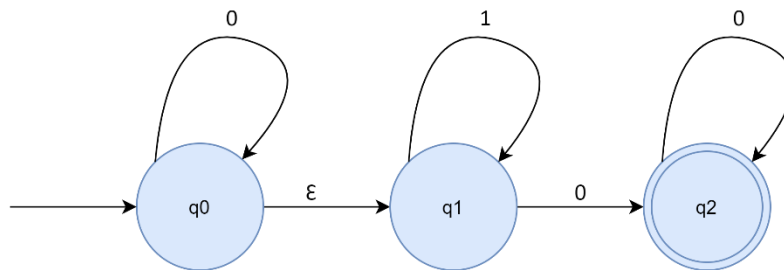
**QUESTION 1**

What are the 5-tuples of a DFA?

What is the difference between the formal definitions of DFA, NFA and  $\epsilon$ -NFA? Explain with a suitable example. **(2+3=5 Marks)**

**QUESTION 2**

Consider the following  $\epsilon$ -NFA:



Convert the  $\epsilon$ -NFA to its equivalent NFA.

What will be the output for inputs “000” and “111”?

**(3+2=5 Marks)**

**QUESTION 3**

Define the transition function,  $\delta$  for an NFA.

“All DFAs are by definition an NFA”- Explain

Suppose you are trying to develop a game where the user starts from the center (0,0) of a standard cartesian coordinate system. The user can either move up (denoted by U/ $\uparrow$ ) or he can move right (denoted by R/ $\rightarrow$ ). Assume the user wins the game if s/he reaches (2,1). Design the NFA that can determine if the user wins the game. Provide, Q,  $\Sigma$ ,  $q_0$ , and F. **(1+2+4=7 Marks)**

**QUESTION 4**

Prepare the state transition table for the NFA you designed. Convert it to its equivalent DFA.

How would you convert a DFA to its equivalent NFA?

Is it possible for a DFA to have more than one final state?

**(5+2+1=8 Marks)**

**\*\*END OF QUESTIONS\*\***