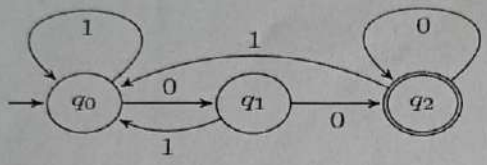
5th batch 6th semester

# Department of Computer Science and Engineering
## University of Barisal
### 3rd Year 2nd Semester Final Examination, 2020

**Course Code: CSE-3203** **Course Title: Theory of Computation**
**Total time: 3.00 hours** **Total marks: 60**

**(Note: Answer any five set of questions from the followings)**

1. a) Construct a context-free grammar for the following DFA: 4




b) In compiler, ambiguous testing is a very important matter. Show that the grammar ({S}, {a, b}, R, S) with rules R = S → aS | aSbS | ϵ is ambiguous. 6

c) Does a push down automata have memory? Justify. 2

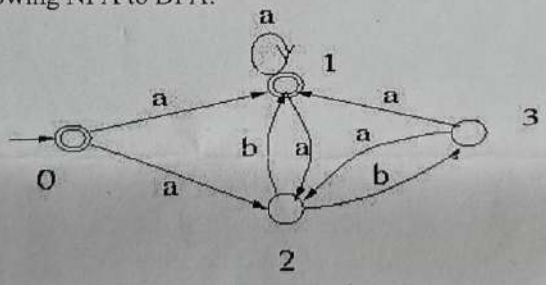
2. a) Why explicit ε-transitions in finite automata is important? 2

b) Build an ε-NFA for the following language: 6
L = {w | w is empty, or if non-empty will end in 01}

c) Convert ε-NFA to DFA based on Question 2(b) 4

3. a) Differentiate between Finite State and Turing Machines. 3

b) Convert the following NFA to DFA. 6




c) How a DFA processes strings? 3

4. a) Define push down automata with example. 3

b) Give pushdown automata that recognize the following languages: 5
(a) A = { w ∈ {0, 1} * | w contains at least three 1s }
(b) B = { w ∈ {0, 1} * | w = $w^R$ and the length of w is odd }

c) Use the pumping lemma to prove that the language A = { $0^{2n} 1^{3n} 0^n$ | n ≥ 0 } is not context free. 4

5. a) Let, ∑ = {0, 1}. Construct a DFA for the following language: 6

L = {w | w is a binary string that has even number of 1s and even number of 0s}

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b) Construct a NFA for the following: Strings where the first symbol is present somewhere later on at least once. 6

6. a) Prove that the following language is either regular or not. 4

$$A = \{ www \mid w \in \{a, b\}^* \}$$

b) Prove that if we add a finite set of strings to a regular language, the result is a regular language. 5

c) Write the closure properties of regular languages. 3

7. a) Describe the relation between Regular Expressions (RE) and Finite Automata. Show with figure that they are interchangeable. 6

b) Convert the following RE to ε-NFA: $(0+1)^*01(0+1)^*$ 6

8. a) Find DFA's which accepts the following languages: 2+2+2

(i) Strings over {a, b} ending in aa.

(ii) String over {a, b} containing three consecutive a's (that is, contains the substring aaa)

(iii) All strings over {a, b} where each string of length 5 contains at least two a's.

b) Consider the regular expression $(a(cd)^*b)^*$. 2+2

(i) Find a string over $\{a, b, c, d\}^4$ which matches the expression.

(ii) Find a string over $\{a, b, c, d\}^4$ which does not match the expression.

c) Does a push down automata have memory? Justify. 2

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