

Digital Assignment

CSE2002 Theory of Computation and Compiler Design – WIN 2022

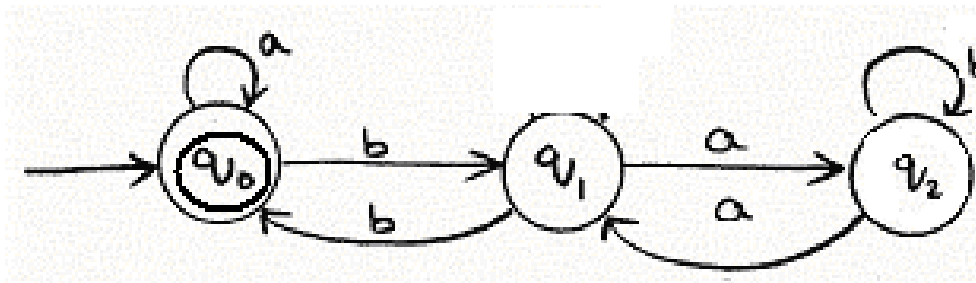
Instructions:

- i) A soft copy of to be uploaded with Name and REG:NO in VTOP.
- ii) Each individual student should Upload the Assignment on or before 20/03/2022
- iii) No other form of submission is allowed.
- iv) If required each student is expected submit HOT Copy of the assignment. (Will be informed later)
- v) **Marks will be deducted**

If proper steps not given and
the assignment should be neat.

Assignment Questions

1. Suppose $\Sigma = \{0,1\}$.
 - (a) Let $L = \{w \mid \text{number of 0's in } w \text{ is of the form } 5i + 3, \text{ for some natural number } i\}$. Give a DFA for L.
 - (b) Let $L = \{w \mid w \text{ has } 01001 \text{ as a substring}\}$. Give a DFA for L.
2. a) Prove that $\{a^p \mid p = n^2 \mid n \geq 1\}$ is regular
b) Consider the following expression grammar
$$\begin{aligned} \text{exprs} &:= \text{exprs} + \text{expr} \mid \text{exprs} * \text{expr} \mid \text{expr} \\ \text{expr} &:= x \end{aligned}$$
Is the grammar is ambiguous or unambiguous? If ambiguous show two different parse trees AND Two Leftmost derivation for the same string. If it is unambiguous give an informal argument?
3. Find the regular expression accepted by following automaton.



4. Consider the following grammar: $S \rightarrow abS \mid acS \mid c$
 - a. Compute FOLLOW(S)
 - b. Build the ACTION/GOTO table using LL(1)
 - c. Use the ACTION/GOTO table to parse the string "acacc"

5. Consider the following grammar: $S \rightarrow S + S \mid S * S \mid (S) \mid \text{num}$
 - a. Compute the canonical set of LL(1) items for the grammar.
 - b. Build the ACTION/GOTO table for the grammar
6. (a) Give a formal description and the corresponding state diagram of a PDA that recognizes the language $L = \{w \mid 2\#_a(w) \neq 3\#_b(w), w \in \{a, b\}^*\}$, where $\#_a(w)$ and $\#_b(w)$ denotes the number of a 's and b 's occurring in the string w .
 (b) Let $L_1 = \{0^n 1^m \mid 0 < n \leq m < 2n\}$. Let G_1 be the grammar with starting symbol S and the following rules:

Rule 1: $S \rightarrow 0S11$

Rule 2: $S \rightarrow T$

Rule 3: $T \rightarrow 0T1$

Rule 4: $T \rightarrow 01$

For each n and m satisfying $0 < n \leq m < 2n$, describe a leftmost derivation of $0^n 1^m$ using the grammar G_1 . (That is, say how many times to apply each rule and in what order.)

7. a) Find a CFG, without λ productions, unit production and useless productions equivalent to the grammar defined by

$S \rightarrow ABaC$

$A \rightarrow BC$

$B \rightarrow b / \lambda$

$C \rightarrow D / \lambda$

$D \rightarrow d.$

Find CNF of context free grammar.

8. Construct a CFG for the $\{a^l b^m c^n \mid l + m = n, m, n > 0\}$.
9. Minimize the following FA. Given NFA- ϵ , convert to NFA- \rightarrow DFA- \rightarrow Min DFA

Here ϵ indicates Epsilon Transition.

