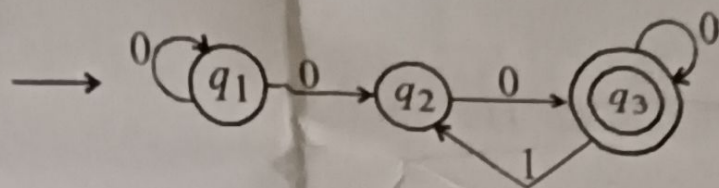


## Part-A

Q. 1. Convert the following NFA to DFA :



Q. 2. Write regular expression for language  $L = \{0^n 1^m \mid n \geq 1, m \geq 0\}$ .

Q. 3. Compare transition functions of NFA and DFA.

Q. 4. Define two-way finite automata.

Q. 5. Can we use finite state automata to evaluate 1's complement of a binary number ?  
How ?

Q. 6. List some applications of automata theory. *compiler, signature*

Q. 7. Define regular grammar with example.

Q. 8. Give a regular expression for the set of all strings not containing 101 as a substring.

Q. 9. Draw a turing machine to compute double the value of an integer.

Q. 10. Draw pushdown automata to accept all palindromes of odd length.

## Part-B

Q. 1. What Language over  $\{0, 1\}$  does the CFG with productions :

$$S \rightarrow 00S \mid 11S \mid S00 \mid S11 \mid 01S01 \mid 01S10 \mid 10S10 \mid 10S01 \mid \epsilon \text{ generate.}$$

Q. 2. Construct an appropriate model to recognize the Language L defined by :

$$L = \{a^n b^m c^m d^n \mid n, m \geq 0\}$$

Q. 3. State and prove any two closure properties of regular languages.

Q. 4. How a CFG for L is converted into CNF accepting same language ?

Convert following CEG into CFG in CNF :

$$S \rightarrow bA \mid aB \quad A \rightarrow bAA \mid aS \mid aB \rightarrow aBB \mid bS \mid b$$



Q. 5. State pumping lemma for CFLs. Write the applications of pumping Lemma for CELs.

Q. 6. Write a note on universal turing machine. *for or more turing machines.*

Q. 7. What is Myhill Nerode Theorem?

OR

What is derivation tree?

### Part-C

Q. 1. Explain why halting problem is unsolvable problem.

Q. 2. Explain Chomsky hierarchy and corresponding type 0, type 1, type 2 and type 3 formalism. *Recursively enumerable, Context sensitive, Context free, Regular*

Q. 3. Prove the equivalence of push down automata and context free grammar.

Q. 4. Describe clearly the equivalent classes of the canonical Myhill Nerode relation for the Language of Binary strings with second last symbol as 0. *Right most 0 and left most 1*

Q. 5. What are tractable problems? Compare with intractable problems.

Q. 6. Write about multitape turing machines.

Q. 7. Consider two tape Turing Machine (TM) and determine whether the TM always writes a nonblank symbol on its second tape during the computation on any input string 'w' formulate this problem as a language and show it is undecidable.

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Recursively

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