Harmanpreet Singh BTCS 502-18

Rollno 1914577 Section-Z

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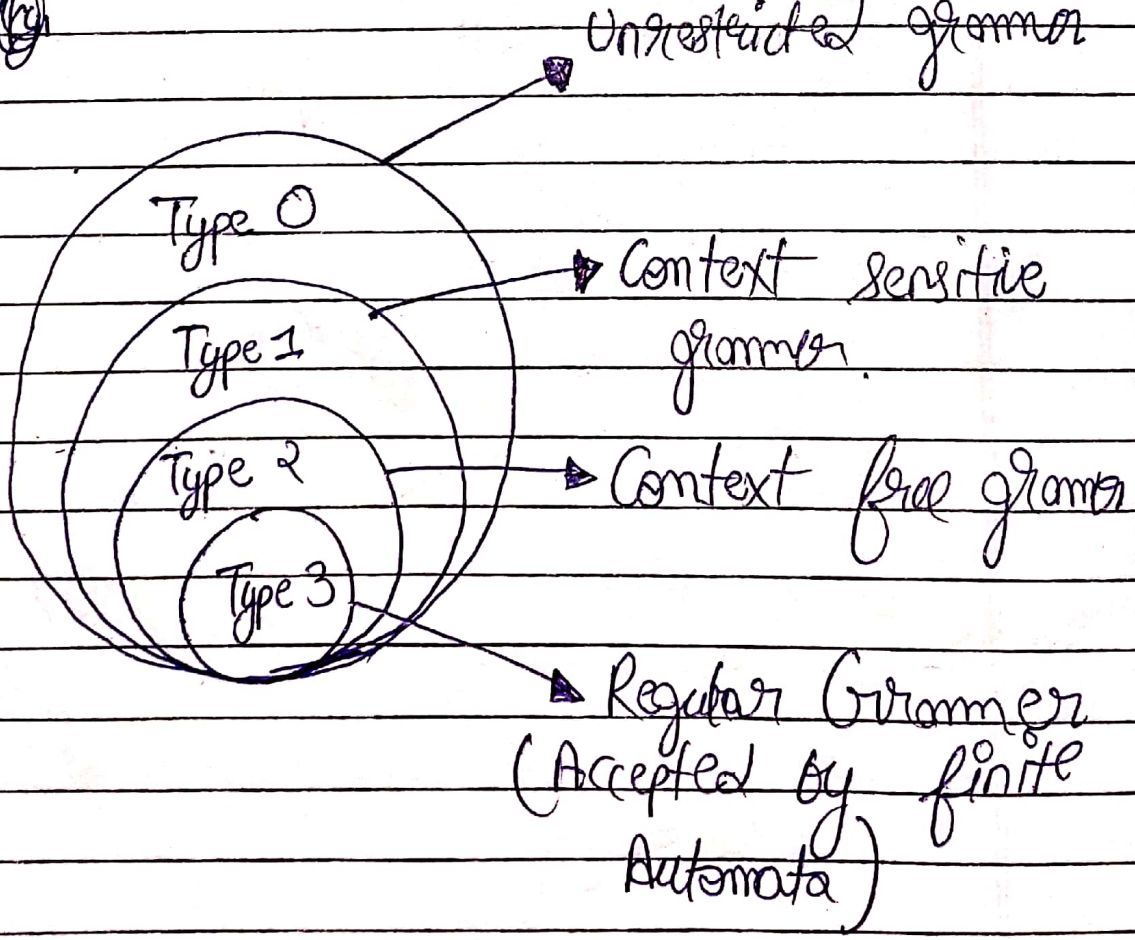
FAT - BTCS - 502-18

Section - A

(4) Describe the Chomsky hireachy of languages with diagram

Ans According of Chomsky hierarchy grammer are divided of 4 types

(a)



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3A. State and Describe GNF form.

Ans GNF - Stands for Greibach Normal form.

A context free grama is in GNF if all the production rules satisfy on of the fllowing.

(1) A Start Symbol generating E [eg S → G]

(2) A non formind generating a termind [eg A → a]

(3) A non termind generating a termind which is followed by any number of non-termind
[eg → S → aASB]

eg G1 = {S → aAB/aB, A → aA/a, B → bB/b}

2Q $L = \{a^n b^{2n} \mid n >= 0\}$

n = 1 L = abb

n = 2 L = aabbbb

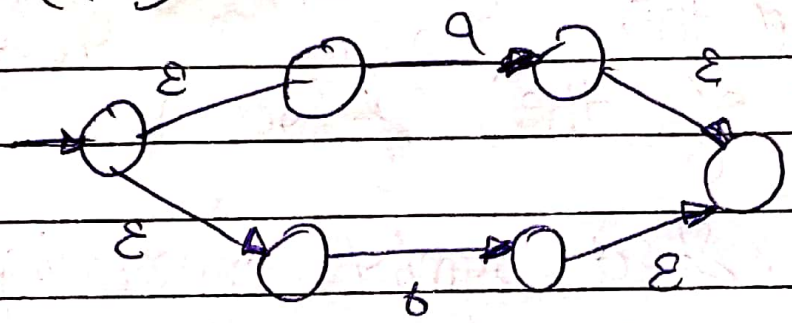
n = 3 L = aaabbbbbb

So

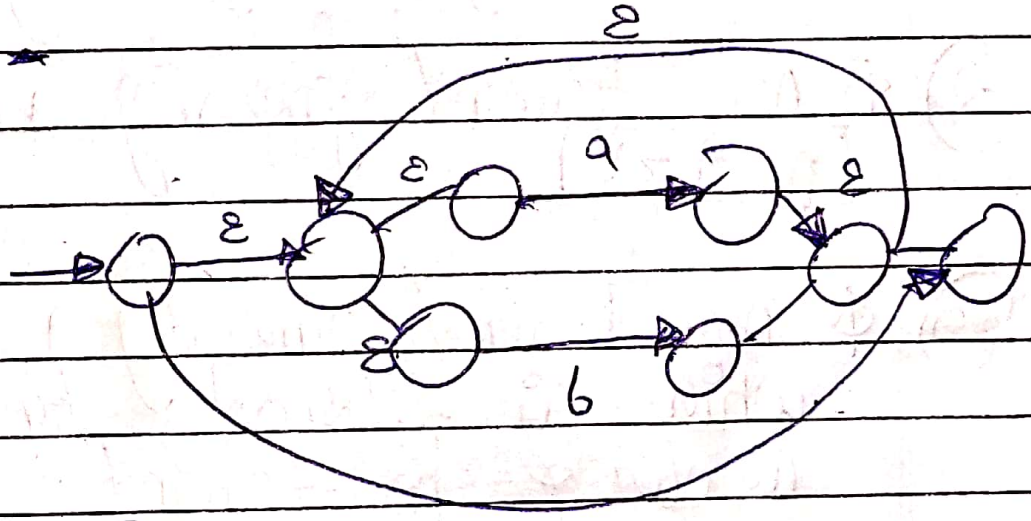
$L = \{ab, aabbb, aaabbbbb, \ldots\}$

Q The given language is $(a+b)^*b$

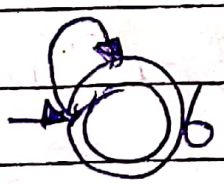
Now $(a+b)$




$(a+b)^*$




(b)




The required NFA with epsilon moves will be:-

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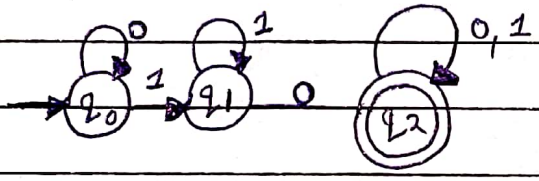
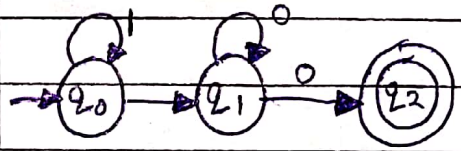
## Section B

5Q Differentiate DFA and NFA with example

| DFA | NFA |
|---|---|
| (1) In DFA, the transition function S takes a state and input signal as argument and return exactly one state as output. | (1) In NFA, the transition function S takes a state and input symbol as argument and return the number of choices for next State. |
| For eg   | For example:   |
| In above figure $S(q_0, 1) = q_1$ which means, it gives exactly one state as output and more is unspecified in DFA | In above figure $S(q_0, 1) = q_0$ or $q_1$ which means it gives more than one state as output. Now suppose if we want input 1 on state $q_2$ $S(q_2, 1) = \phi$ which is unspecified |
| (2) Digital computers are completely deterministi -c. i.e this State | (2) NFA is just a concept and is not |

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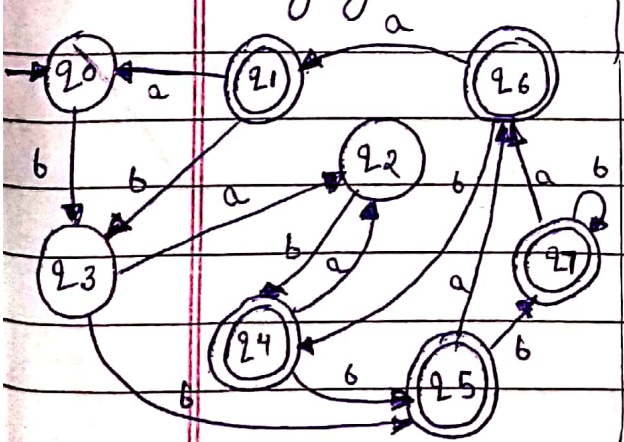
at any time is predictive from the input.

(3) Designing a DFA is different as compared to NFA

(4) Understanding the functioning of DFA is difficult as compared to NFA

Example For example :- Let L be the language consisting of all the thing over {a,b} containing b in position from the end. Following DFA recognize this language :-



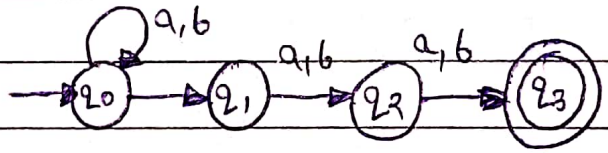

DFA has 8 states and it is difficult to understand.

associated with the real computer.

(3) NFA is easier to design.

(4) Understanding the functioning of NFA is easier

eg :- NFA for some problem is shown in the following figure.




The NFA has only four states and it is not easier to understand.

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# FLAT MST Section - B

Q Compare Mealy and moore machine

Ans

| Moore Machine | Mealy Machine |
|---|---|
| (1) In moore machine, the output depends on present states and is independent of correct input | (1) Output depends on present state and present input |
| (2) In moore machine the output function is defined as $Q \rightarrow \Delta$ | (2) In mealy machine the output function is defined as $Q \times \Sigma \rightarrow \Delta$ |
| (3) If the input string of length n then output string length will be n+1 | (3) If input string of length n then output string will be of same length n. |

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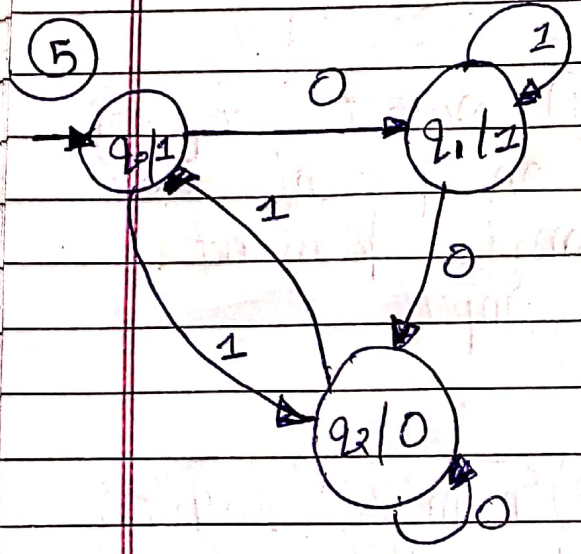
(4) when we convert moore to mealy we have same number of states and some number of edges

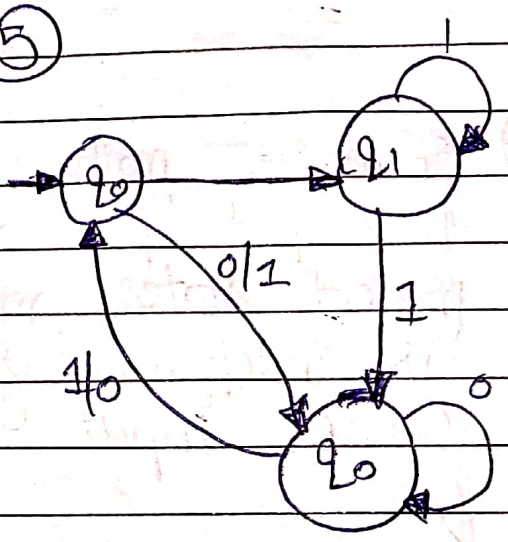
(4) When we convert mealy to moore both states and edges increased.

(5)




Moore Machine

(5)




Mealy Machine

## Section-C

Q) Convert the following NFA to DFA

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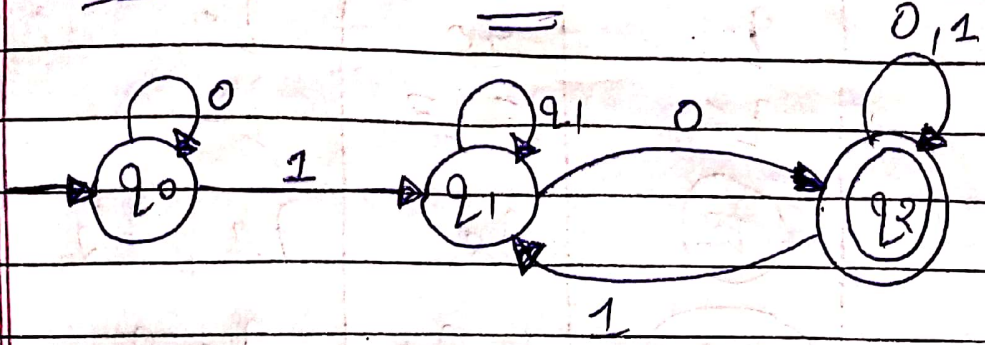
Q8 The Given NFA




Solution :- For the given transition diagram we will first construct the transition table.

| State | 0 | 1 |
|---|---|---|
| →q0 | q0 | q1 |
| q1 | q1q2 | q2 |
| (q2) | q2 | q1, q2 |

The state [q1, q2] is the final state as well as because it contains a final state q2. The transitional table for constructed DFA will be :-

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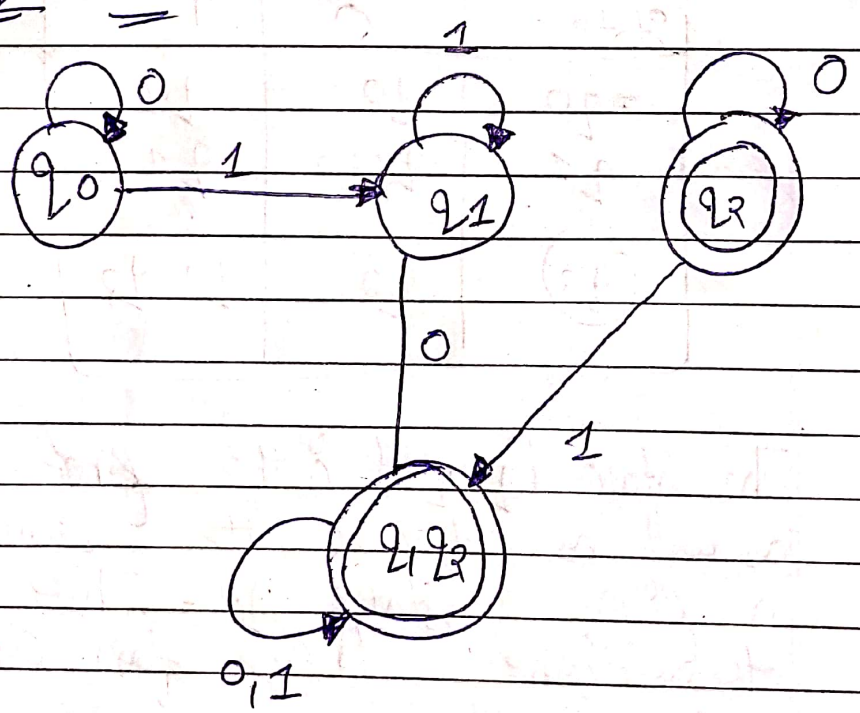
| State | 0 | 1 |
|---|---|---|
| $q_0$ | $q_0$ | $q_1$ |
| $q_1$ | $q_1 q_2$ | $q_1$ |
| $(q_2)$ | $q_2$ | $q_1, q_2$ |
| $(q_1 q_2)$ | $q_1 q_2$ | $q_1 q_2$ |

Required DFA :-




The Required DFA

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(9) B We have

$G = (\{A, B, S\}, \{0, 1\}, P, S)$ P consists of $\{S \to aSb | aAb, A \to bAa, A \to ba\}$,

Productions are :-

$$S \to aSb \mid aAb$$
$$A \to bAa$$
$$A \to ba$$

Now $S \to aSb$

$S \to aaAbb$ (by $S \to aAb$)

$S \to aabAabb$ (by $A \to bAa$)

$S \to aabbabb$ (By $A \to ba$)

Thus, in the string aa bb aa bb

these is a repition.

Now $S \to aSb$

$S \to aaSbb$ (by $S \to aSb$)

$S \to aabAabbb$ (by $S \to aAb$)

$S \to aaabaabbb$ (by $A \to bAa$)

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again $S \rightarrow aSb$

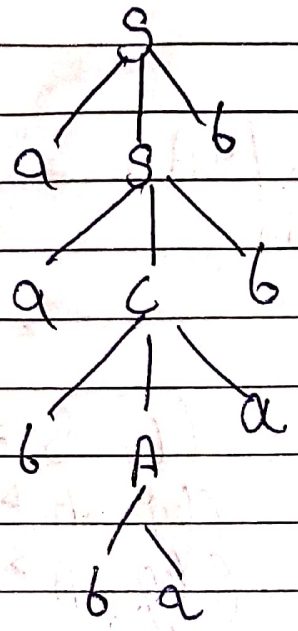
$S \rightarrow aaaAbbb$ (by $S \rightarrow aAb$ & $S \rightarrow aSb$)

$S \rightarrow aaaAbbb$ (by $A \rightarrow bAa$)

$S \rightarrow aaabAabbb$ (by $A \rightarrow bAa$)

$S \rightarrow aaabbabbb$ (by $A \rightarrow ba$)

(1)

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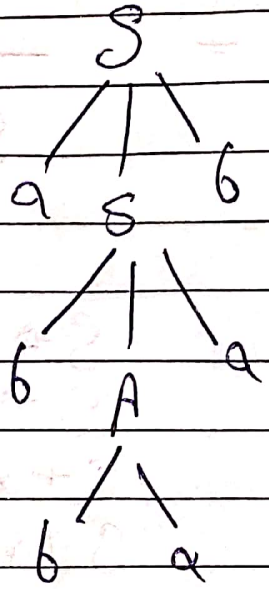
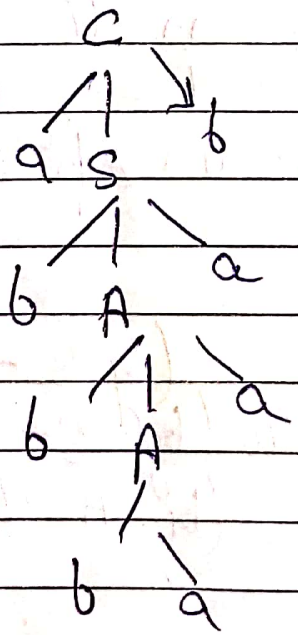



(3)




$\therefore (LCFG) = \{a^m b^n a^n b^m \mid n, m > 0\}$