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COMPUTER SCI - ~~AND~~ - AUTOMATA THEORY APP TEST -

a) (3)

Types	Grammer	Production Rule
Type 0	Unrestricted	$(N \cup T)^+ \rightarrow (N \cup T)^*$
Type 1	Context Sensitive	$(N \cup T)^+ \rightarrow (N \cup T)^+$
Type 2	Context free	$N \rightarrow (N \cup T)^*$
Type 3	Regular	$N \rightarrow T / TN(\epsilon)$

b) $G = [\{a, S\}, \{S, A, B\}, S, P]$

$S \rightarrow Aba$

$A \rightarrow a$

$Ab \rightarrow AAbA | ABb | AbB$

$B \rightarrow A | AB$

i) Type 1 Grammar [Context Sensitive] : Because it has both Terminals and Non-terminals on the left hand side, Terminal and Non-terminals on the right hand side and doesn't not contain an empty element

ii) Regular ~~expression~~ languages are are Type 3 grammars that must have a single Non-terminal on the left-hand side ~~so~~ and consisting of a single terminal or single terminal followed by a single non-terminal.

iii) It is an ambiguous grammar because it has more than one left most derivation, more than one right-most derivation and more than one parse tree.

(4)

a) i) Finite Automation can be defined as an automation with a finite number of states.

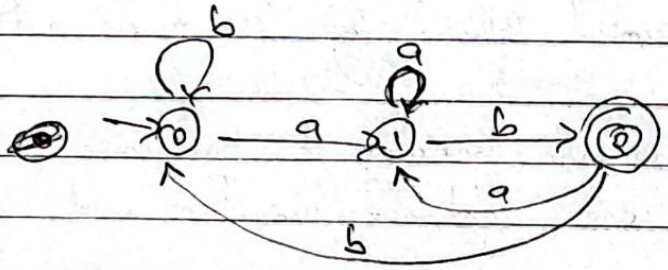
ii) Transition Diagram can be defined as the graphical representation of finite automation.

b) NFA, meaning Non Deterministic Finite Automation can let the machine move to any combination of the states in the machine for a particular input symbol

DFA, meaning Deterministic Finite Automaton doesn't let the machine move to any state unless to produces the required input symbol.

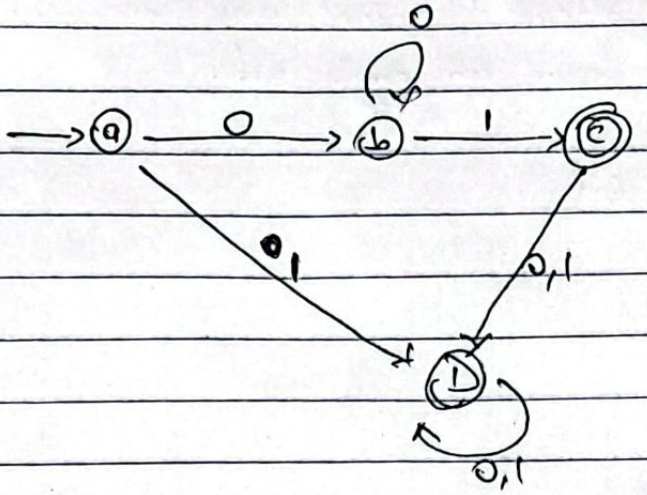
c) string {a, b}
ending with ab

Input = 2
No. of states = 3

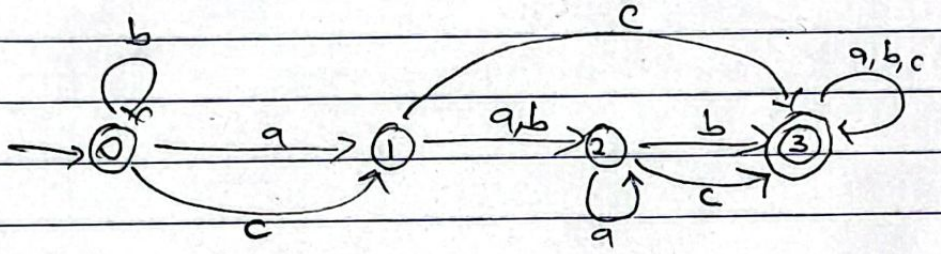


	a	b
0	1	0
1	0,1	2
2	0,1	0

d) No. of input = 2
No. of states = 3



e) No. of input = 3
No. of states = 4



a) Kleene star operation concatenates Terminals and non-terminals on a way that they can have an empty set or not.
Kleene positive operation concatenate Terminal and non-terminals on a way that they should not have an empty set.

b) i) $A \cup B = \{1, 2, 3, 4, 5, 6\}$
ii) $C \cap D = \{6, 8\}$
iii) $E = A \cap C = E = \{2, 4\}$
iv) $B - D = \{3, 4, 5\}$

~~e) i) = 1a2~~

c) i) = 1a2c56
ii) = 26R@8
iii) = 23*!=
iv) = 45pq=c

d) $S \rightarrow aSb \mid T$
$T \rightarrow aT \mid \varepsilon$

Ans = Context free.

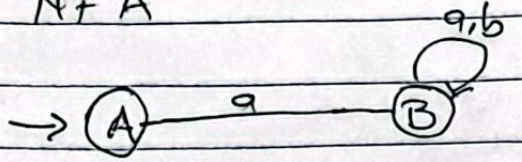
e) $S \rightarrow aXb \mid Y$
$X \rightarrow aX \mid \varepsilon$
$Y \rightarrow Yb \mid \varepsilon$

Ans = Context free and Regular

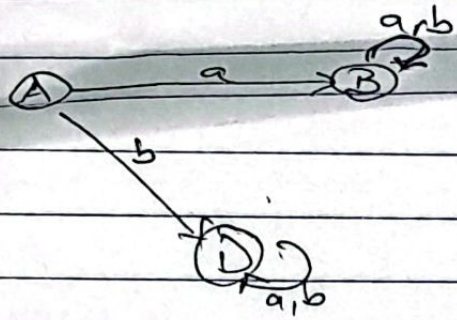
(5)

a) DFA is an NFA in the sense that all DFA transition go from a state to the next state to the right or to the same state, which all NFA are capable of doing. But NFA is not a DFA because, transitions in NFA can go backwards and DFA cannot go backwards.

b) NFA

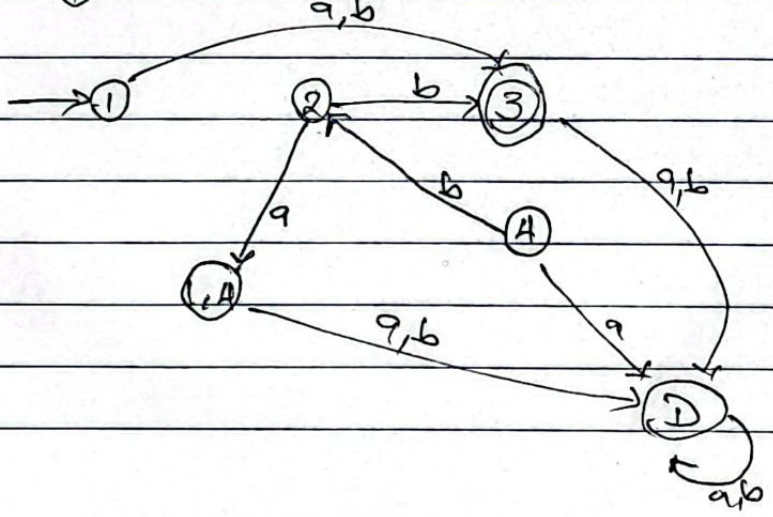


DFA



	a	b
A	B	D
B	B	B
D	D	D

c)



(5) cont.d

d)