Mid Semester Exam

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Subject : Theory of Computation
Code : CS2204
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(1)

(b) FALSE.

Regular languages are Context free but the opposite is not true i.e all context free are not regular.

For RG, $G = (V, \Sigma, R, S)$ ~~$R \subset (V-\Sigma) \times (\Sigma^*)$~~

$R \subset (V-\Sigma) \times (\Sigma^* . ((V-\Sigma) \cup \{e\}))$

For Context free grammar

$G = (V, \Sigma, R, S)$

$R \subset (V-\Sigma) \times V^*$.

(a) TRUE

~~A fin~~

We can consider a ~~of~~ finite language L over an alphabet Σ as a finite set of strings. It contains the symbols of Σ.

But, we can also say that those string are ~~language~~ alphabet Σ' and symbols for some other's language L', hence L can be alphabet of some other language.

Hence we can conclude that any finite language L over an alphabet Σ can itself be the alphabet for some other language L'. thus TRUE

(c) TRUE

We know ϕ is a regular language over Σ.

~~Also if a $\in \Sigma$, then~~ a

and $a \in \Sigma$.

Since regular language is closed under Kleene star we can also say the $\{\epsilon\} \in \{a\}^*$

hence the statement both ϕ and $\{\epsilon\}$ are regular languages over the alphabet $\{a, b\}$.

(2)
(a) $\{a^m b^n c^l \mid l, m, n \geq 0 \text{ and } m \leq l+n\}$.

m	l	n	equiv string
0	0	0	e
0	0	1	b
1	2	2	~~abbc²~~ abbcc
0	1	1	bc
⋮	⋮	⋮	⋮

rules

$S_1 \rightarrow S_1 c$ $\quad S_1 \rightarrow e$

$S_1 \rightarrow a S_1 c$

$S_1 \rightarrow S_2$

$S_2 \rightarrow S_2 b$ $\quad S_2 \rightarrow e$

$S_2 \rightarrow a S_2 b$

$G = (V, \Sigma, R, S)$

where $V = \{S_1, c, a, S_2, b\}$

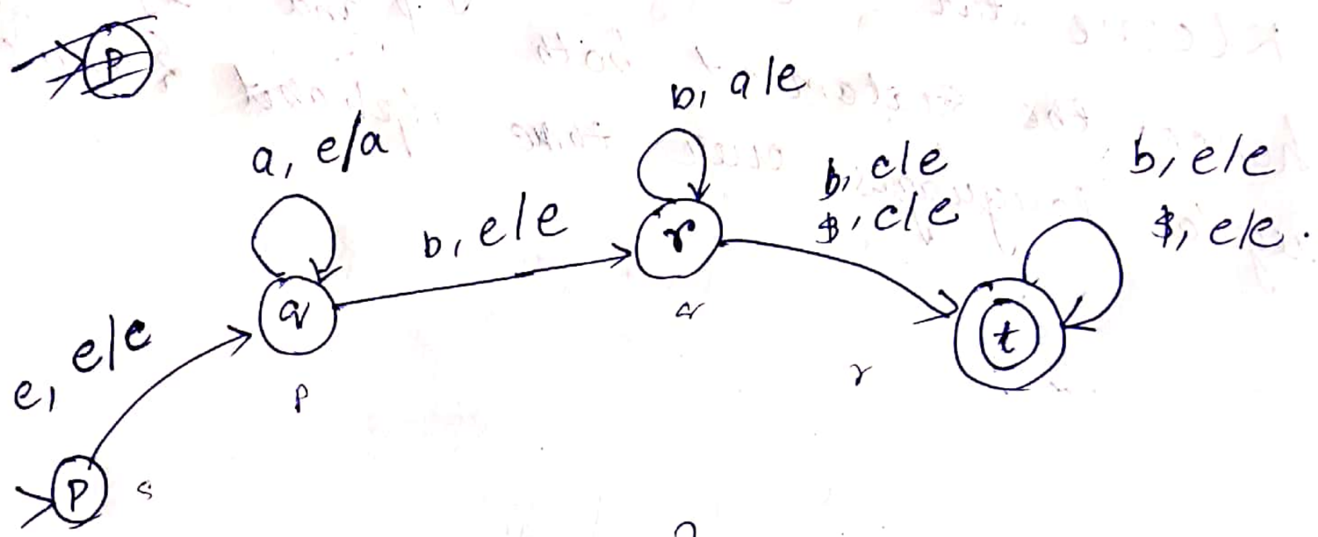
$\Sigma = \{a, b, c\}$

$R = \{S_1 \rightarrow S_1 c,\ S_1 \rightarrow a S_1 c,\ S_1 \rightarrow S_2,$
$S_2 \rightarrow S_2 b\ \ S_2 \rightarrow a S_2 b$
$S_1 \rightarrow e,\ S_2 \rightarrow e$
$S_1 \rightarrow e\}$

$S = S_1$

(2)

(b) $\{a^m b^n \mid m, n \geq 0 \text{ and } m \neq n\}$



$K = \{p, q, r\ t\}$

$\Sigma = \{a, b\}$

$T = \{a, e\}$

$s = p$

$F = t$

Q2)
(c)

$G = (V, \Sigma, R, S)$

$V = \{S, A, B, a, b\}$

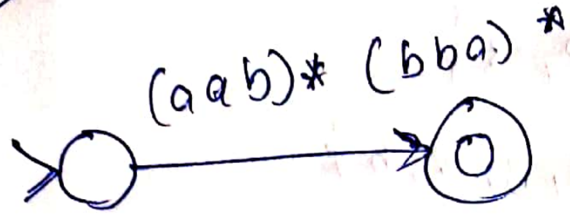
$\Sigma = \{a, b\}$

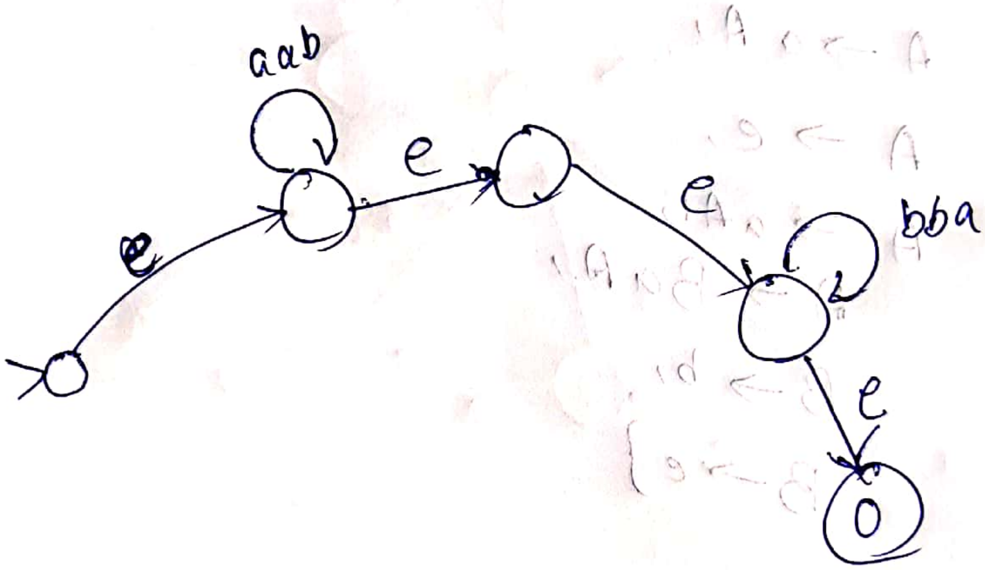
$S = S$

$R = \{ S \to Aa,$
$A \to aA,$
$A \to e,$
$A \to aAB$
$A \to BaA,$
$B \to b,$
$B \to e\}$

Scanned with CamScanner

4 (a)

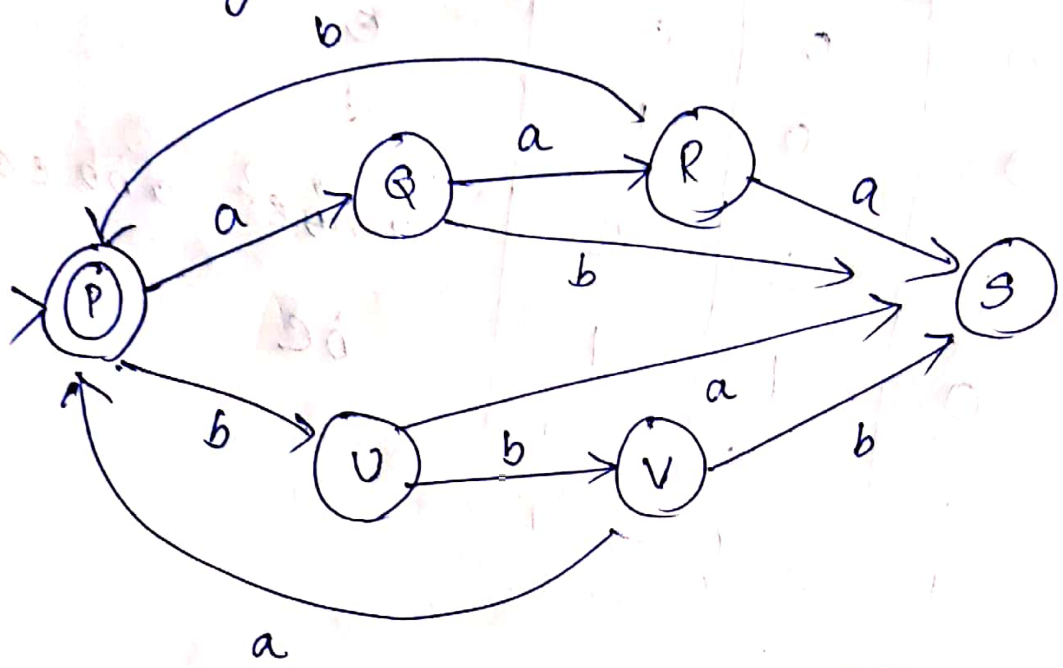




then
we can construct the DFA.

4a contd

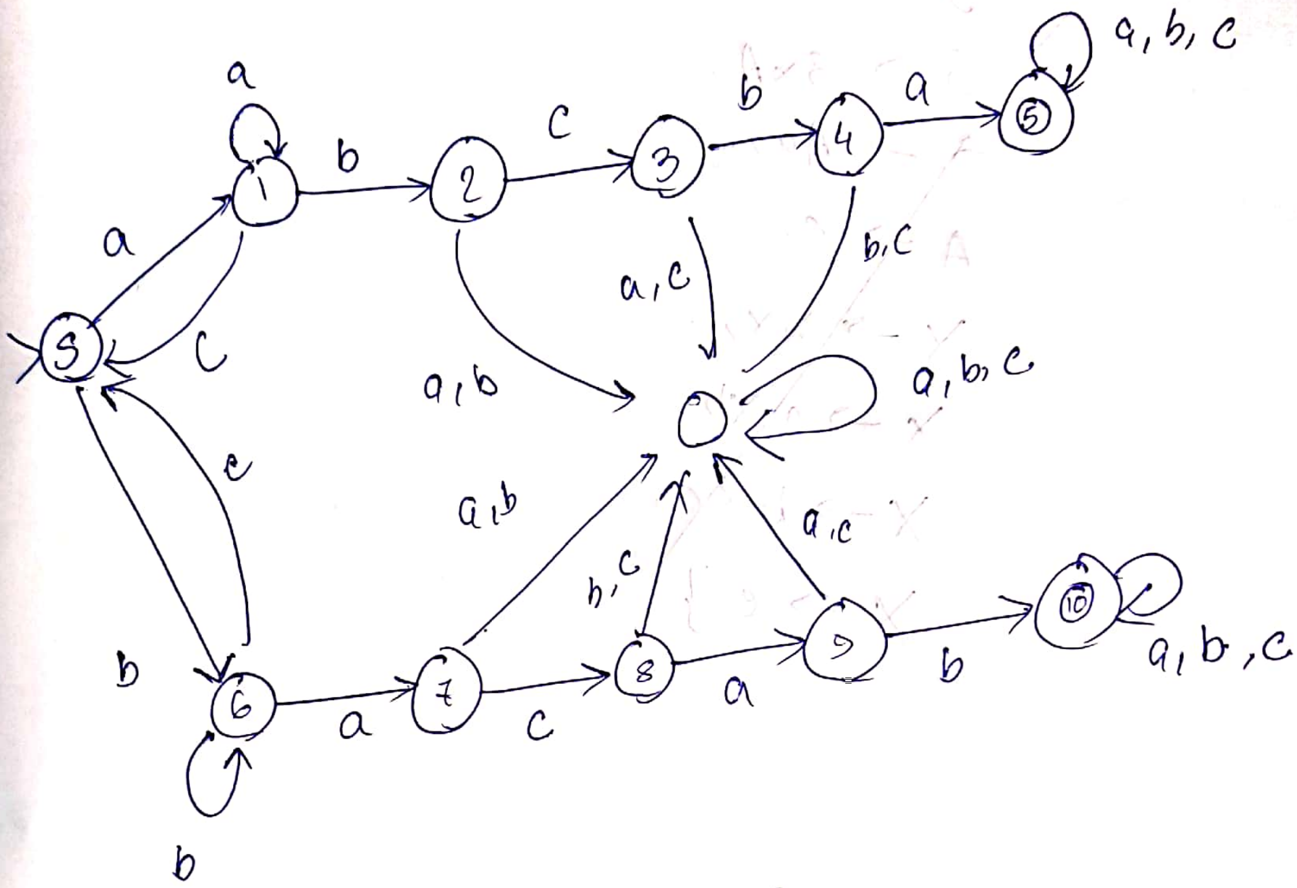
The language $L \subseteq \{a, b\}^*$ represented by the regular expression



The DFA of the lange $L \subseteq \{a, b\}^*$

(4)

(b)



$M = (K, \Sigma, \delta, s, F)$

$s = S$

$F = \{5, 10\}$

$K = \{S, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\}$

$\Sigma = \{a, b, c\}$

$\delta \rightarrow$ as drawn above