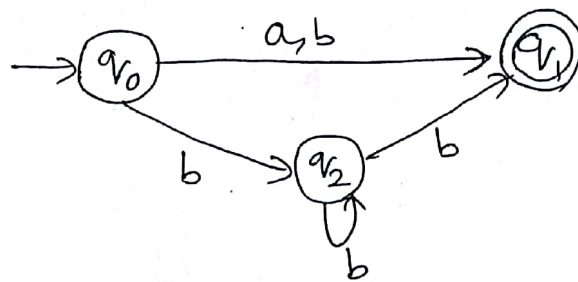


Evaluation Scheme (Mid Sem - 2018)
FLAT (CS-3003)
(5th Semester)

Q1. a.

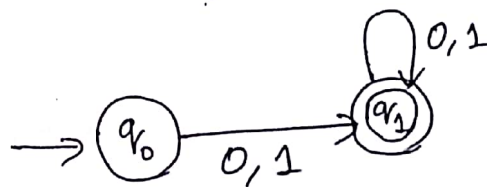


b. $L_1 \cdot L_2 = \{a^n : n \geq 2\}$

c. Both are equivalent because both represent $(a+b)^*$

d.

MUN :



MNN :



e. $\delta^*(1, ba) = \delta(\delta^*(1, b), a) = \delta(\{2, 7\}, a) = \{1, 3, 4, 6\}$

2.

a. $a^* + b^*$

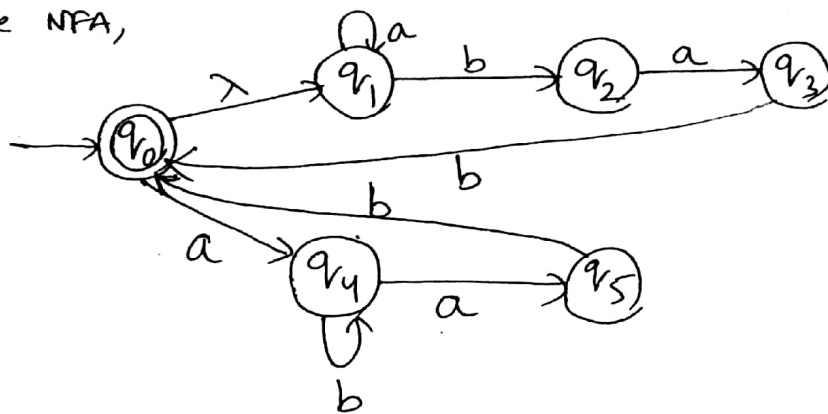
b. $(aa)^* b (bb)^* + a(aa)^* (bb)^*$

c. $(a+b)^* (aaa + aab + aba + bbb + bab + baa + abb) + (\lambda + a + b)^2$

d. $a^+ + (a^* b a^* b a^*)^*$

e. $aa(a+b)^2(a+b)^*aa + ab(a+b)^2(a+b)^*ab + ba(a+b)^2(a+b)^*ba + bb(a+b)^2(a+b)^*bb$

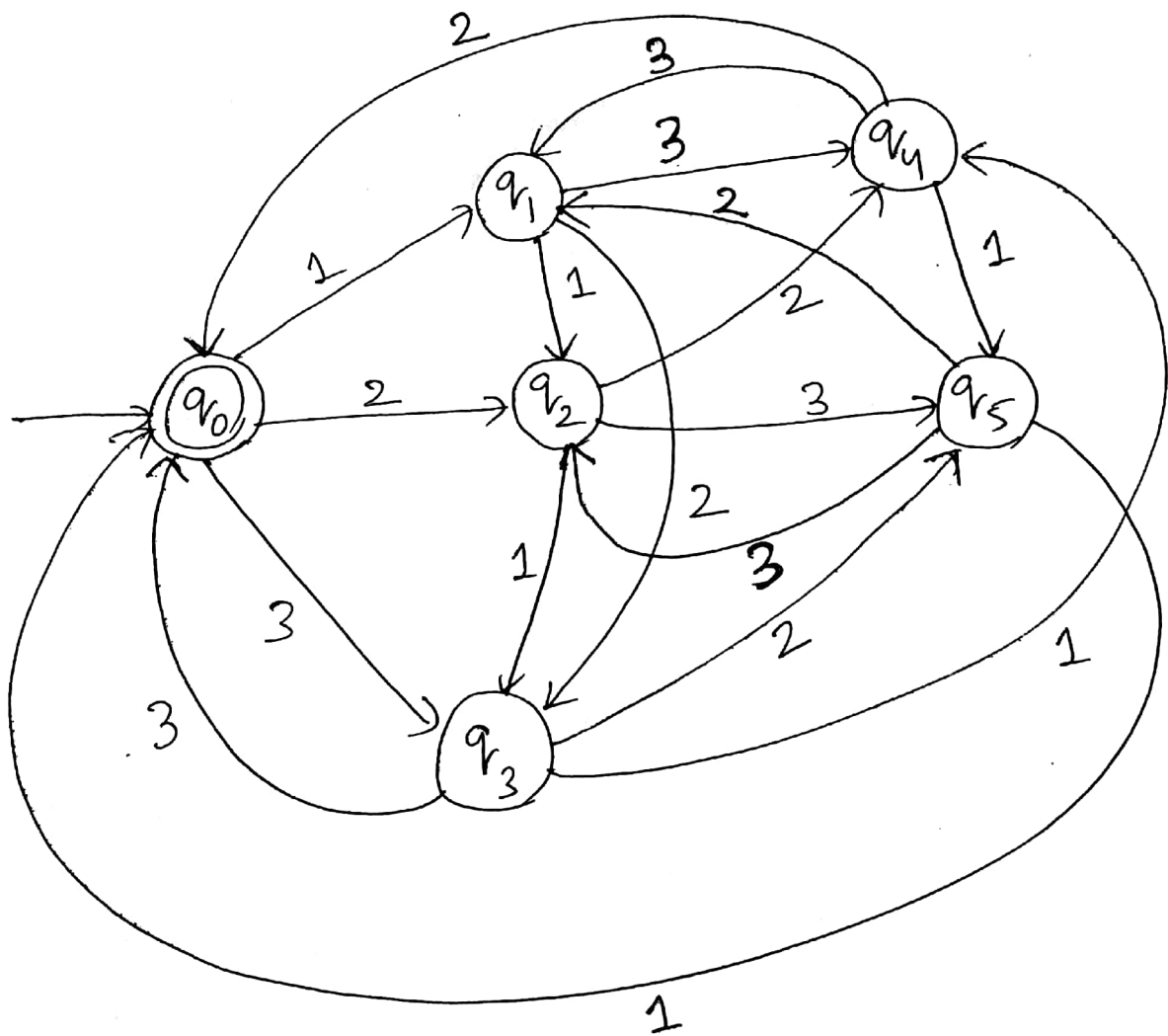
Q3. a. The NFA,



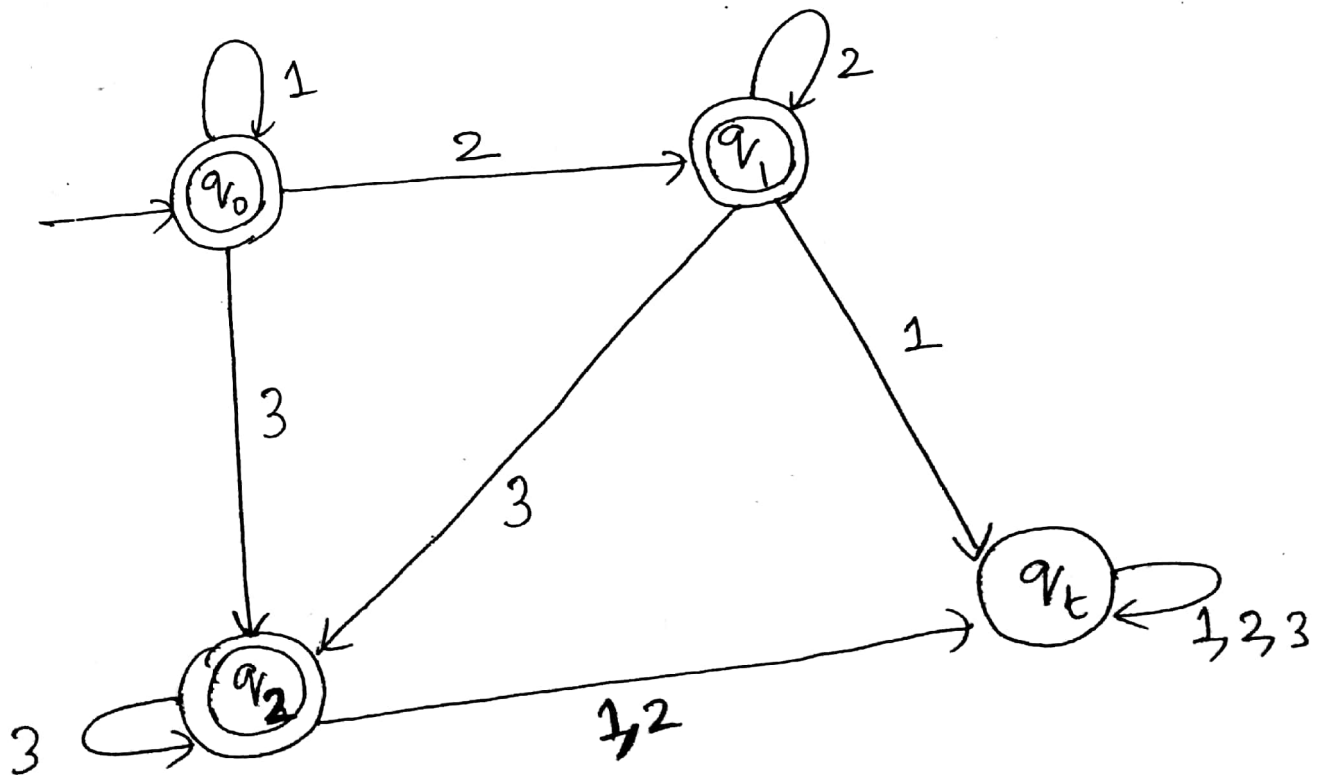
b.

δ	a	b
$\rightarrow [q_0 q_1]$	$[q_1 q_4]$	$[q_2]$
$[q_2]$	$[q_3]$	\emptyset
$[q_3]$	\emptyset	$[q_0 q_1]$
$[q_1 q_4]$	$[q_1 q_5]$	$[q_2 q_4]$
$[q_1 q_5]$	$[q_1]$	$[q_4]$
$[q_2 q_4]$	$[q_3 q_5]$	$[q_2]$
$[q_1]$	$[q_1]$	$[q_2]$
$*[q_0 q_1 q_2]$	$[q_1 q_3 q_4]$	$[q_0 q_1]$
$[q_3 q_5]$	\emptyset	$[q_4]$
$[q_4]$	$[q_5]$	$[q_0 q_1 q_2 q_4]$
$[q_1 q_3 q_4]$	$[q_1 q_5]$	$[q_0 q_1]$
$[q_5]$	\emptyset	$[q_2 q_4]$
$*[q_0 q_1 q_2 q_4]$	$[q_1 q_3 q_4 q_5]$	$[q_0 q_1 q_2 q_4]$
$[q_1 q_3 q_4 q_5]$	$[q_1 q_5]$	\emptyset
\emptyset	\emptyset	

Q4.
a.



b.



Q5.

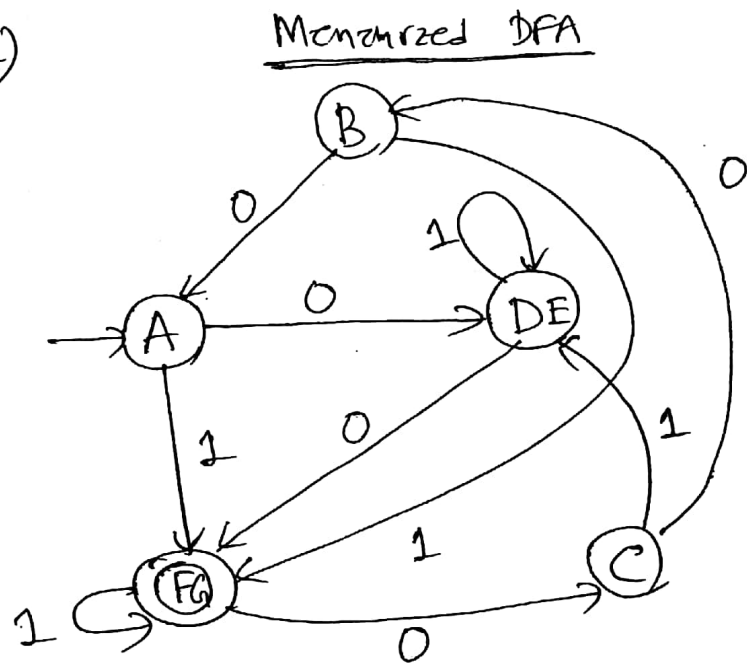
a. After applying minimization,

$[A]$, $[B]$, $[C]$, $[D, E]$, $[F, G]$

and (H is unreachable)

The DFA

δ	0	1
$\rightarrow A$	DE	FG
B	A	FG
C	B	DE
DE	FG	DE
* FG	C	FG



b. If the removal order is $\{B, C, DE\}$, then the regular expression will be

$$(1 + 01^*0) (1 + 001 + 011^*0 + 000(01^*0 + 1))^*$$

The regular expression may be different depending on removal order of states.