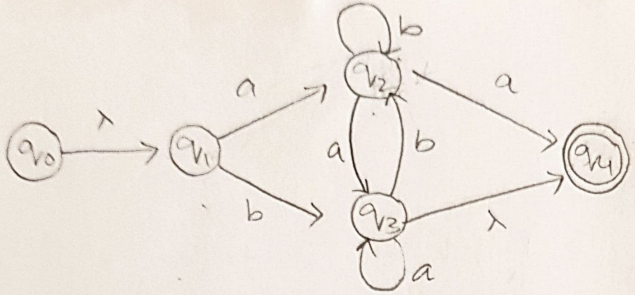
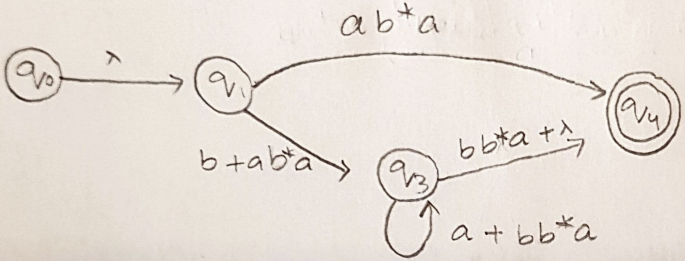
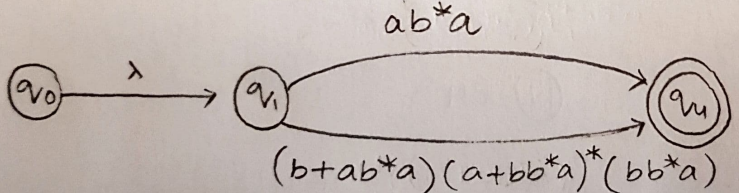
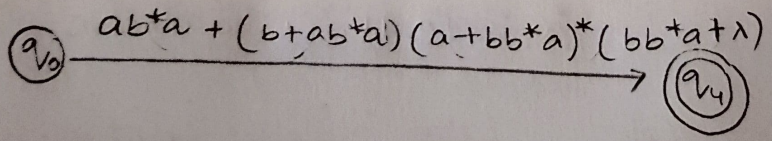
Q1i)



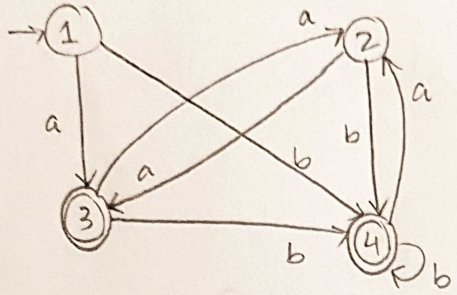


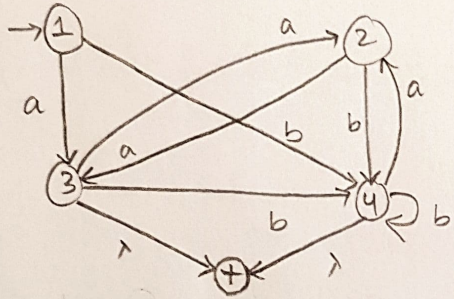




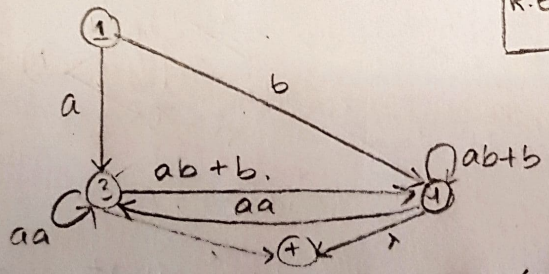
$$R.E = ab^*a + (b+ab^*a)(a+bb^*a)^*(bb^*a+\lambda)$$

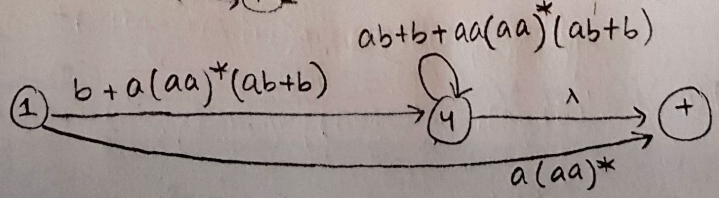
Q 1 ii)

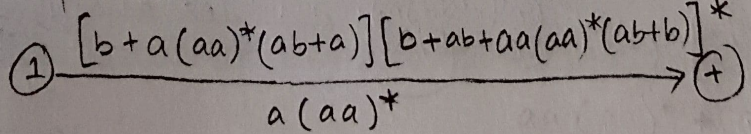




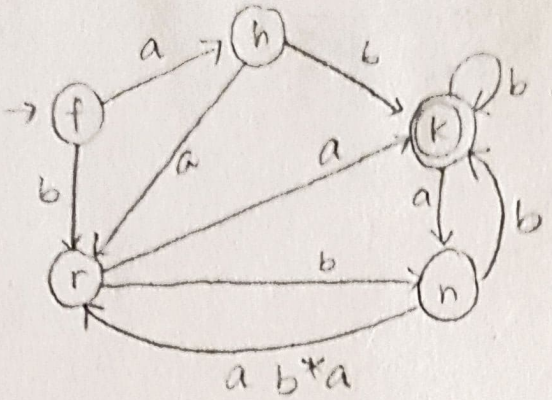
$$R.E = a(aa)^* + \left(b + a(aa)^*(ab+a)\right)\left(b + ab + aa(aa)^*(ab+b)\right)^*$$

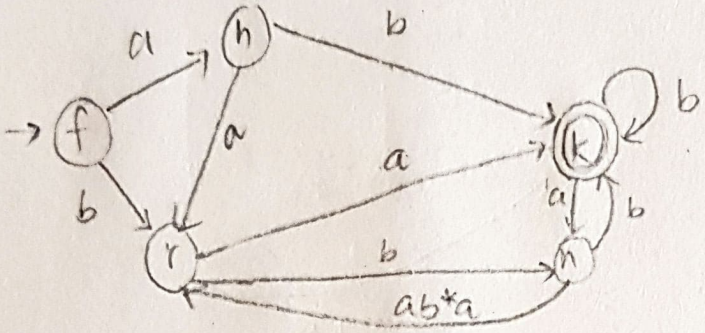


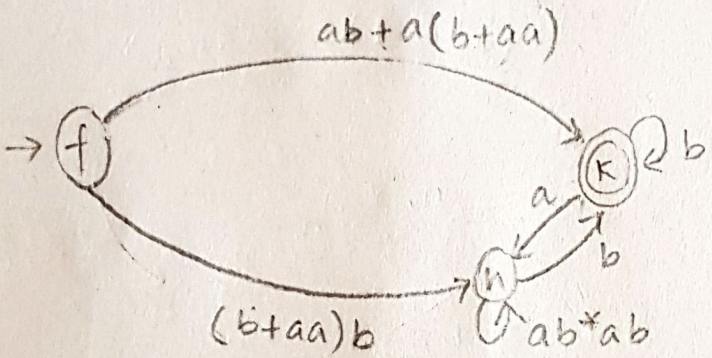


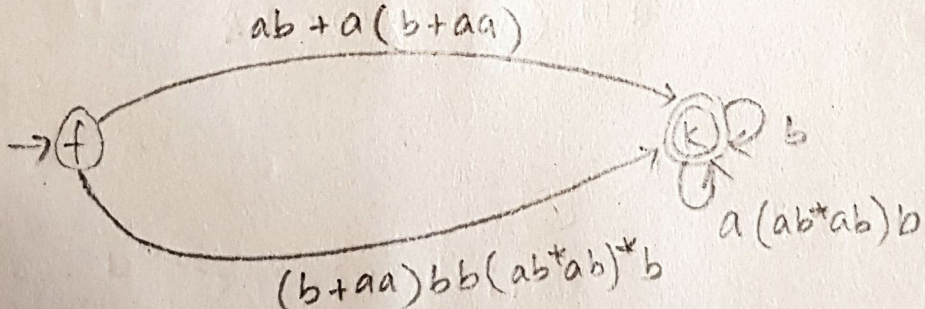


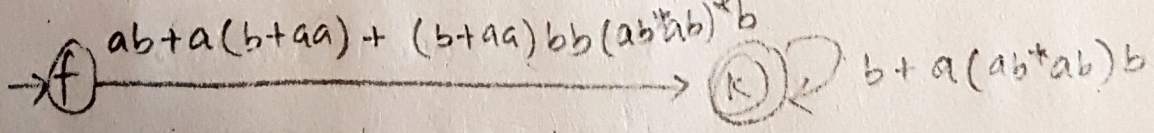
(iii)











$$R.E = \left(ab + a(b+aa) + (b+aa)\,bb\,(ab^*ab)^*b\right)\left(b + a(ab^*ab)b\right)^*$$

(b)

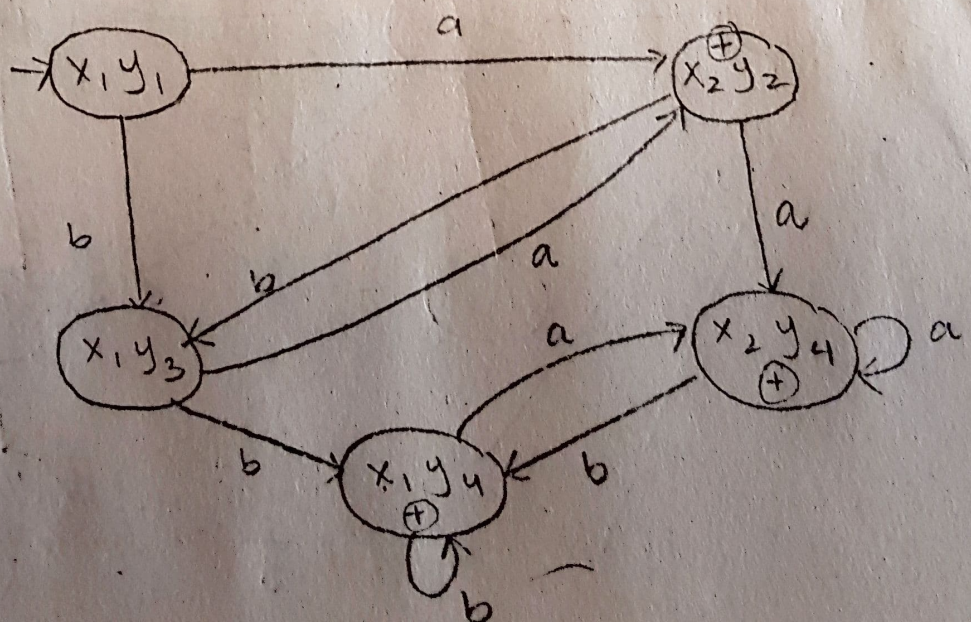
FA1

	a	b
x1	x2	x1
x2	x2	x1

FA2

	a	b
y1	y2	y3
y2	y4	y3
y3	y2	y4
y4	y4	y4

	a	b
$x_1 y_1$	$x_2 y_2$	$x_1 y_3$
$x_2 y_2$	$x_2 y_4$	$x_1 y_3$
$x_1 y_3$	$x_2 y_2$	$x_1 y_4$
$x_2 y_4$	$x_2 y_4$	$x_1 y_4$
$x_1 y_4$	$x_2 y_4$	$x_1 y_1$



(c)

FA1

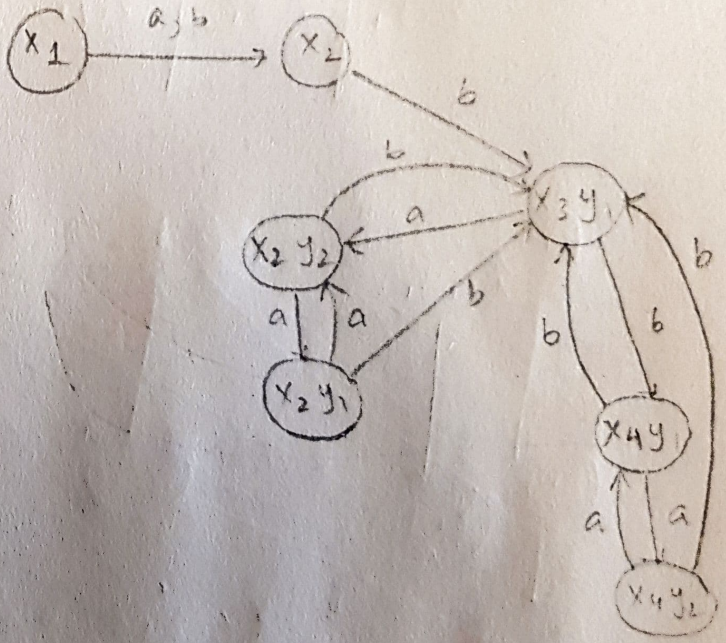
	a	b
x_1	x_2	x_2
x_2	x_2	x_3
x_3	x_2	x_4
x_4	x_4	x_3

FA2

	a	b
y_1	y_2	y_1
y_2	y_1	y_1

M1. M2. $x_3 \rightarrow y_1$

	a	b
x_1	x_2	x_2
x_2	x_2	$x_3 y_1$
$x_3 y_1$	$x_2 y_2$	$x_4 y_1$
$x_2 y_2$	$x_2 y_1$	$x_3 y_1$
$x_4 y_1$	$x_4 y_2$	$x_3 y_1$
$x_2 y_1$	$x_2 y_2$	$x_3 y_1$
$x_4 y_2$	$x_4 y_1$	$x_3 y_1$



(d) The paper "probabistic kleene theorem" provides a new approach to probabilistic reasoning & regular expression. Links the probabilistic automata & classical kleenes theorem

They prove that probability of a string matching R.E can be computed as sum of probabilities of all path that leads to that string in the corresponding probabilistic automata.

This paper provides algorithm for computing the probability of an R.E, learning & discussing potential applications in NLP & bio informatics.

The paper "kleene theorem for timed automata" discusses theory of R.E in real time languages. Main design: signal semantics, integer bounded interval, separating clock & using renaming. The author used standard kleene theorem to add resetting states after reducing to one-clock automata.

Q2)

	a	b	c
1	3 I	4 I	2 I
2	5 III	5 III	5 III
3	6 III	7 III	7 III
4	7 III	7 III	5 III
5	11 II	8 II	2 I
6	9 II	10 II	3 I
7	10 II	11 II	4 I
8	11 II	5 III	7 III
9	10 II	6 III	7 III
10	9 II	7 III	7 III
11	11 II	7 III	7 III

(I) 1 2 3 4

(II) 8 9 10 11

(III) 5 6 7

(VI) 1