

UNIVERSITY OF TECHNOLOGY, JAMAICA

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

THEORY OF COMPUTATION (CIT3006)

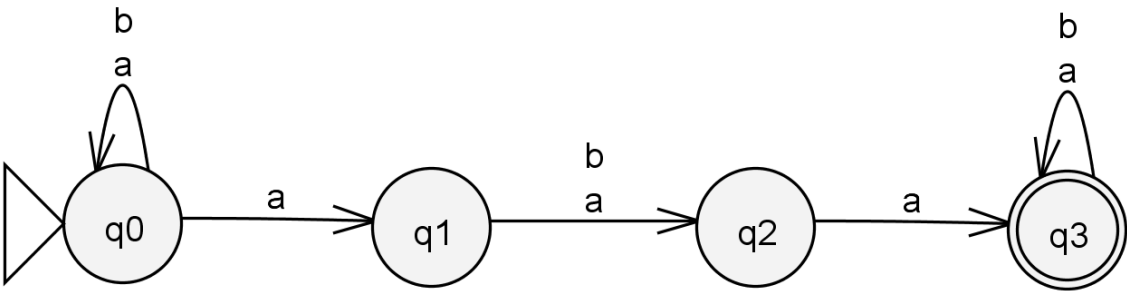
PROBLEM SHEET

Due: March 30, 2018 @ 11:50pm

QUESTION 1: NFA to DFA

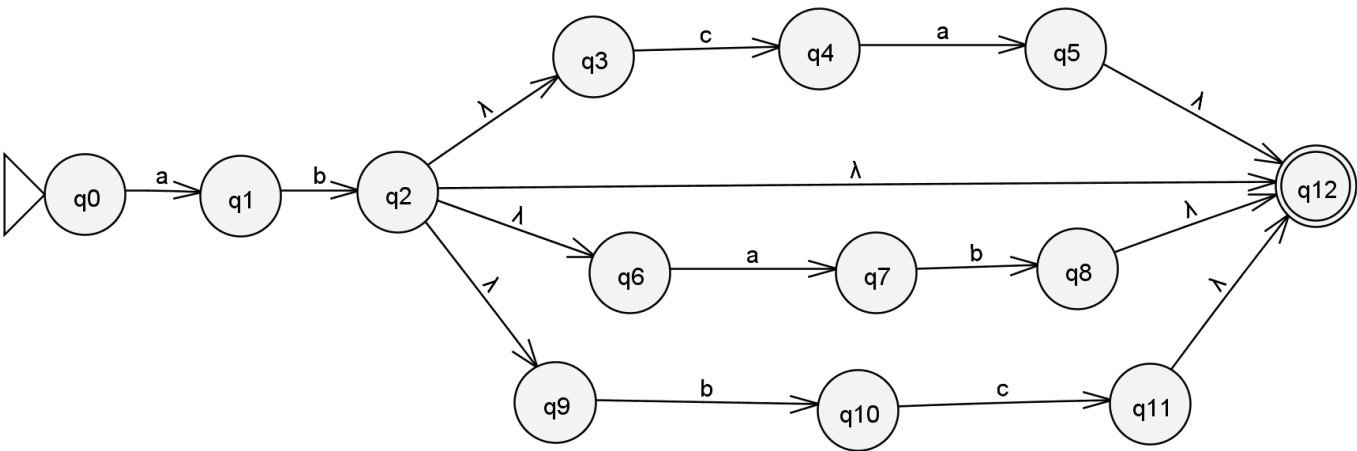
- a. Convert the NFA below into a DFA using the Table method. Recall that $D=2^Q$ determines the number of rows.

[6 Marks]



- b. Convert the NFA below to a DFA using table or shortcut method. Show all outgoing transitions to the null state.

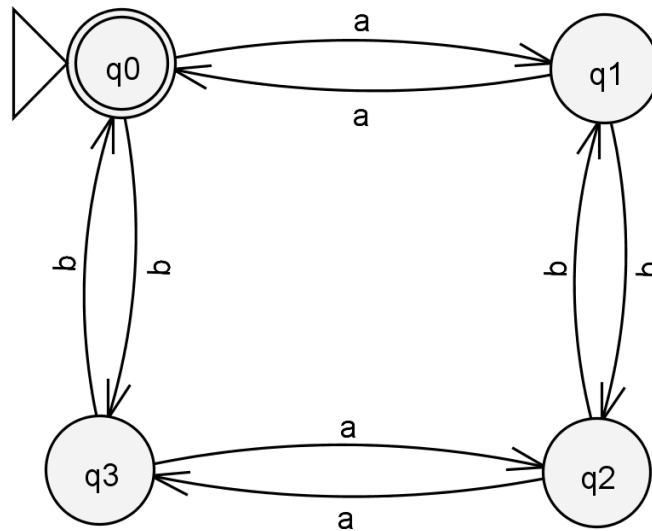
[8 Marks]



QUESTION 2: DFA to RE

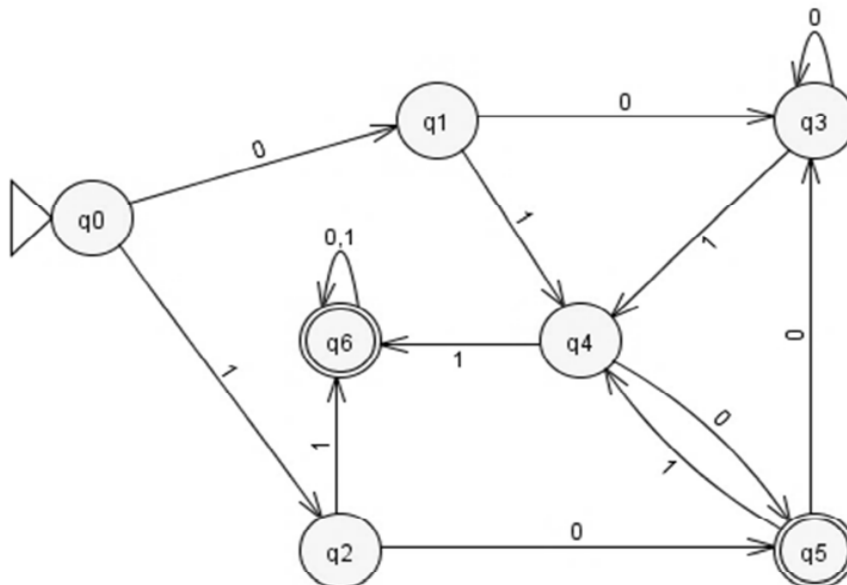
- a. Convert the DFA shown below to regular expression. Show all steps for deleting each state.

[4 Marks]



- b. Convert the DFA shown below to regular expression. Show all steps for deleting each state.

[6 Marks]



QUESTION 3: RE to DFA

Construct DFAs for the REs below using **no more than 4 states**.

a. $(A \cup B) C (AB)^*$

[2 Marks]

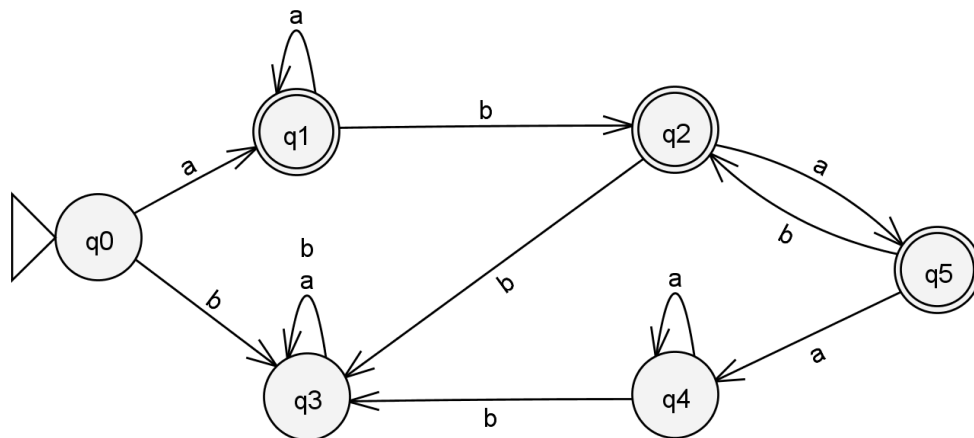
b. $\varepsilon (1)^* 01$

[3 Marks]

QUESTION 4: DFA MINIMIZATION

- a. Minimize the DFA given below using either the partition or table method. Show all steps and draw the minimized DFA.

[6 Marks]



- b. Minimize the DFA based on the state transition table given

[4 Marks]

δ	0	1
Q0	Q1	Q2
Q1	Q2	Q3
Q2	Q4	Q6
Q3	Q4	Q5
Q4	Q3	Q6
Q5	Q5	Q6
Q6	Q5	Q6

Start state = Q0, Finals States = {Q5, Q6}

QUESTION 5: PUMPING LEMMA

a. Show that Language $L = \{www \mid w \in \{0, 1\}^*\}$ is not regular **[4 Marks]**

b. Show that Language $L = \{M^n M^{2n} M^{3n} \mid n \geq 0\}$ is not context free **[5 Marks]**

QUESTION 6: GRAMMAR & PDA DESIGN

Give the equivalent CFG and PDA for questions a and b below.

a. $L1 = \{w \mid w \in \{x, y, z\}^*, \text{ where } w \text{ is } x^n y^3 z^{2n} \mid n \geq 0\}$ **[6 Marks]**

b. $L2 = \{w \mid w \in \{0, 1\}^*, \text{ where } w \text{ starts and ends with the same symbol and } |w| \bmod 5 = 0\}$

[8 Marks]

QUESTION 7: PARSE TREE

Consider the following grammar:

$A \rightarrow ABA \mid (A) \mid -A \mid B$

$B \rightarrow + \mid - \mid * \mid / \mid A \mid x \mid y$

a. Give the parse tree for the following string $(-x + y) * x - y / (-y + x)$ **[6 Marks]**

b. Give derivation for string $(y / y) - x * (-y)$ **[4 Marks]**