University of Asia Pacific

Department of Computer Science & Engineering

Mid-Semester Examination Fall -2020

Program: B. Sc. Engineering (3rd Year/1st Semester)

Course Title: Theory of Computation   Course No. CSE 307   Credit: 3.00

Time: 1.00 Hour.   Full Mark: 60

There are **Four** Questions. **Answer questions 1, 4 and (2 or 3)**. All questions are of equal value/Figures in the right margin indicate marks.

1.a) Differentiate the *transition function* between Deterministic Finite Automata and Nondeterministic Finite Automata.   6

b)   Let $\sum$ = {the letters/symbols of your own name}   14

Suppose you want to construct the following language:

   "The set of all strings that accept any string of *your first name length* <u>but will not accept your name as a string</u>."

   Draw a corresponding NFA.

2.   Suppose my name is '**a**bdul **b**aten'. I use the first letter of my first name and last name in the below figures. Use first letters of your **own name (first name and last name)** in the figure(s), draw it in your script and then: 6 + 14

   i)   Find out the ϵ-closure for each state. (Figure 1)

   ii) Find the equivalent states and minimized DFA. (Figure 2)

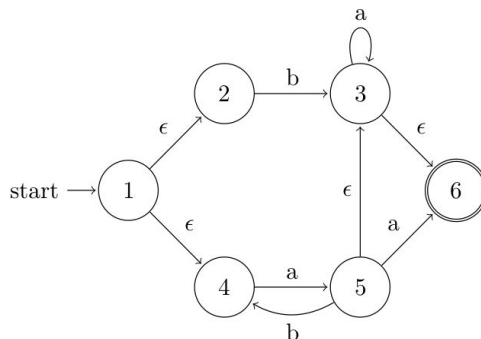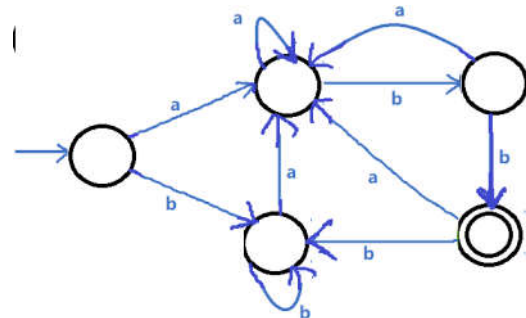Figure 1   Figure 2

3.a) Let $\sum$ = {the letters/symbols of your own name}   4+4

Suppose you are wanting to construct the following language:

"The set of all strings that have *your first name* or *last name* as a substring."

    i) Write the regular expression for this language.

    ii) Draw the corresponding NFA.

b) Suppose my name is '**a**nisuj **z**aman'. I use the first letter of my first name and last   12
name in the below figures. Use first letters of your own name (first name and last
name) in the figure(s), draw it in your script and then construct the regular expression
using formula.
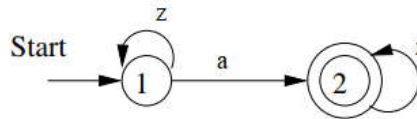
4.a) Suppose, my id is 17101021. First two digits (17) stand for admission year 2017, then   10
next digit (1) stand for Spring semester (i.e. 2 stands for Fall semester, 3 stands for
Summer semester), then 01 which stands CSE department (0x indicates another
department), and last three digits (021) stands for my class roll.

Now, write your **own id** and then write a regular expression for all the id's of your
class. *Please note:*

- Year is same as your admission year and **also** previous two years.
- It includes all the semesters.
- The range of class roll is 001 to 999 but roll 002, 005, 012, 015, 022, 025,
 … … 992, 995 are reserved for special purpose and should **not** be
 included.

b) Write regular expression for 24-hour clock system. The format is [hh]:[mm].   10

- [hh] refers to a zero-padded hour between 00 and 24 (where 24 is only used to
 denote midnight at the end of a calendar day).
- [mm] refers to a zero-padded minute between 00 and 59.

Example of some valid times:

00:00, 00:01, … 00:59, … 11:23, … 21:44, … 23:59