

King Saud University  
College of Computer and Information Sciences  
Computer Science Department  
CSC 340 Mid-1

key

Student Name:

mid term

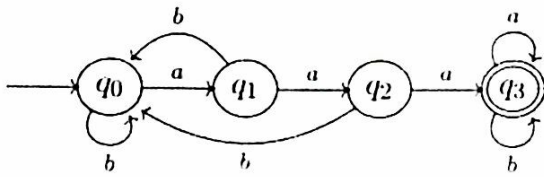
2016-2017

Student Number:

Q1) (14 marks) Put a circle around the symbol of the best answer for each of the following

- 1) Which of the following features must be available in a programming language to be suitable for writing embedded systems
  - ☒ a) Provide constructs for low-level control over hardware.
  - b) Use floating point representation
  - c) Have features to analyze data
  - d) All of the above.
- 2) An orthogonal programming language
  - a. Has a relatively small set of primitive constructs that can be combined in a relatively small number of ways to get the desired results.
  - b. Has a fewer number of exceptions because every possible combination is legal.
  - c. Is good with respect to reliability
  - ☒ d) All of the above
- 3) Which of the following features a programming language need to have in order to be good with respect to reliability
  - a. Data types
  - b. Support for abstraction
  - c. Exception handling
  - ☒ d) all of the above
- 4) Having a small number of manageable features and constructs, makes a programming language good with respect to
  - a. Readability
  - b. Writability
  - c. Reliability
  - ☒ d) All of the above
- 5) A language with too many operators and special symbols is
  - a. good with respect to writability
  - b. bad with respect to reliability
  - c. bad with respect to readability
  - ☒ d) all of the above
- 6) Java is partly compiled and partly interpreted (hybrid implementation) makes is
  - ☒ a) Good for writing portable programs
  - b. Good for writing efficient programs
  - c. Good for reducing the cost of training
  - d. All of the above
- 7) Classes, inheritance and polymorphism designed in programming languages as a result of
  - a. The Von-Neumann architecture
  - ☒ b) Programming methodologies
  - c. People preferences
  - d. None of the above

Q 2) Consider the following DFA over the alphabet  $\Sigma = \{a, b\}$



a) (2 marks) In your own words describe the language accepted by the above DFA.

accepts a string if it has 3 consecutive a's

b) (4 marks) Write a regular expression that describes the language accepted by the above DFA.

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

~~$b^* a a a (a+b)^*$~~

~~$b^* (a+b)^* a a a (a+b)^*$~~

~~$b^* (a+b)^* a a a b^*$~~

~~$b^* (a+b)^* a a a (a+b)^* b^*$~~

c) (2 marks) Represent the DFA using a table.

	q <sub>0</sub>	q <sub>1</sub>	
q <sub>0</sub>	q <sub>0</sub>	q <sub>1</sub>	
q <sub>1</sub>	q <sub>2</sub>	q <sub>0</sub>	
q <sub>2</sub>	q <sub>3</sub>	q <sub>0</sub>	
q <sub>3</sub>	q <sub>3</sub>	q <sub>3</sub>	

d) (5 marks) Write an algorithm that uses the above table to decide if a string is acceptable by the DFA

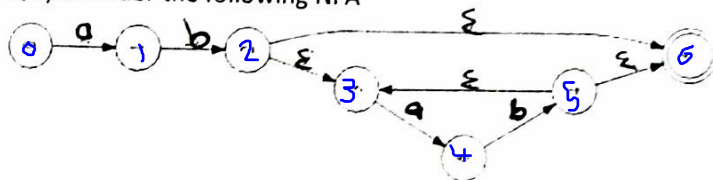
$\emptyset = \emptyset$   
 state =  $\emptyset$

while (input  $\neq \epsilon$ )

state = A[state, input[0++]];

if (state == q<sub>3</sub>) display "accept"  
 else  
 display "reject"

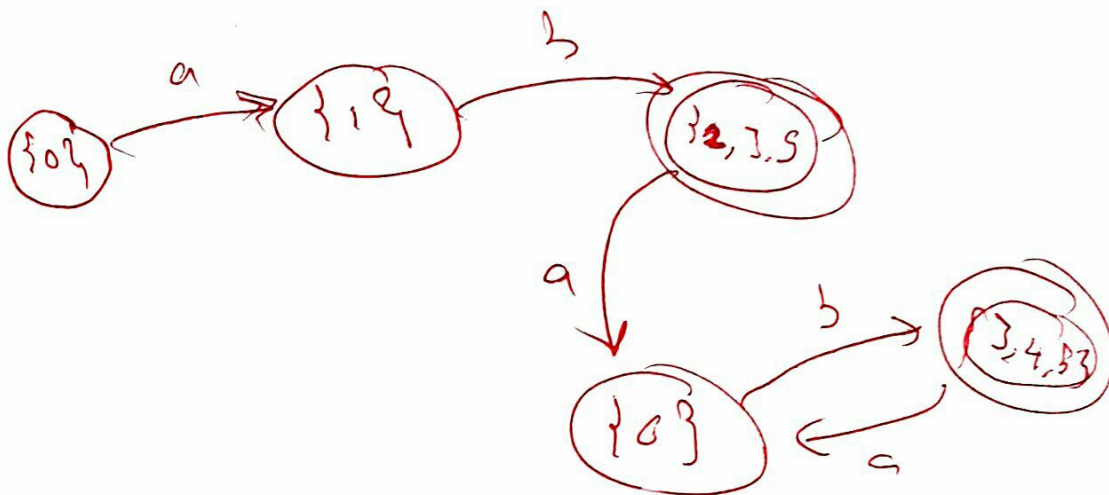
Q 3) Consider the following NFA



- a) (2 marks) Describe the language accepted by the above NFA using a regular expression.

$(ab)^+$

- b) (4 marks) Convert the above NFA into a DFA.



Q 4) (6 marks) Write a CFG describing a language over the alphabet  $\Sigma=\{a,b\}$ , containing all strings with

- a) equal number of a's and b's.

$S \rightarrow aSbS \mid bSaS \mid \epsilon$

- b) the number of a's is double the number of b's.

$S \rightarrow aSbSaS \mid aSaSbS \mid bSaSaS$   
 ~~$S \rightarrow aSaSbS \mid aSbSaS \mid \epsilon$~~