

**Program: BSc Computer Science**

**Course code: BCS1110**

**Examiners: dr. Ashish Sai & dr. Thomas Bitterman**

**Date/time: 24-Oct-2023, 17:00 to 19:00**

**Format: Closed book exam**

**Allowed aids: Pens, simple (non-programmable) calculator from the DACS list of allowed calculators**

# Sample Exam Paper

**BCS1110**

2023/24

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### Multiple Choice Question

**Instructions:** For the following multiple-choice questions (MCQs), only one answer is correct. Please select the most appropriate option.

- 3p **1a** Example multiple choice question. I think the instructor for this class is really mean because:
- ☐ a He gives us really long, mean assignments
  - ☐ b He makes us show up for class on time
  - ☐ c He asks mean multiple choice questions
  - ☐ d None of the above. He is, in fact, sweet and charming
- 3p **1b** According to Moore's Law, approximately how often was the number of transistors on a computer chip supposed to double?
- ☐ a Every 1 year
  - ☐ b Every 2 years
  - ☐ c Every 5 years
  - ☐ d Every 10 years
- 3p **1c** In a deterministic finite automaton (DFA), what is the number of transitions defined for each symbol in the alphabet for every state?
- ☐ a Zero
  - ☐ b One
  - ☐ c More than one
  - ☐ d Two
- 3p **1d** Which service is NOT typically part of Amazon's AWS?
- ☐ a Amazon S3 (Cloud Storage)
  - ☐ b Amazon Kindle
  - ☐ c Manages Servers
  - ☐ d Website Hosting

3p    **1e** Which of the following is NOT a common method used in Two-Factor Authentication (2FA)?

- ☐ a Something you know (password)
- ☐ b Something you have (mobile device)
- ☐ c Something you like to eat (a type of food)
- ☐ d Something you are (fingerprint)

3p.    **1f** Which encryption uses a different key for encrypting and decrypting data?

- ☐ a Symmetric
- ☐ b Asymmetric
- ☐ c Monometric
- ☐ d CSRF

### Course Theme and Computing Hardware

3p    **2a** Identify some advantages and disadvantages of a using a Biometric authentication system in a company (Hint: think about privacy)?


6p **2b** Convert the following binary numbers to decimal:

- a.  $(01101)_2$
- b.  $(011110)_2$
- c.  $(1011000)_2$
- d.  $(111111)_2$
- e.  $(1101)_2$
- f.  $(111110)_2$


2p **2c** Complete the truth table for the logical statement A OR (B AND (NOT C)) and draw the circuit diagram for this system (**2d**) .

4p    **2d**

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## Algorithm and version control

4p **3a** Name a type of algorithm that is not a program


6p **3b:** Create a flowchart and pseudocode for the process of getting ready to leave the house in the morning. Include such activities as hitting the snooze button several times, taking a shower, getting dressed, and so on. Make sure to have different procedures depending on whether it is a weekday or weekend

## Theory of Computation

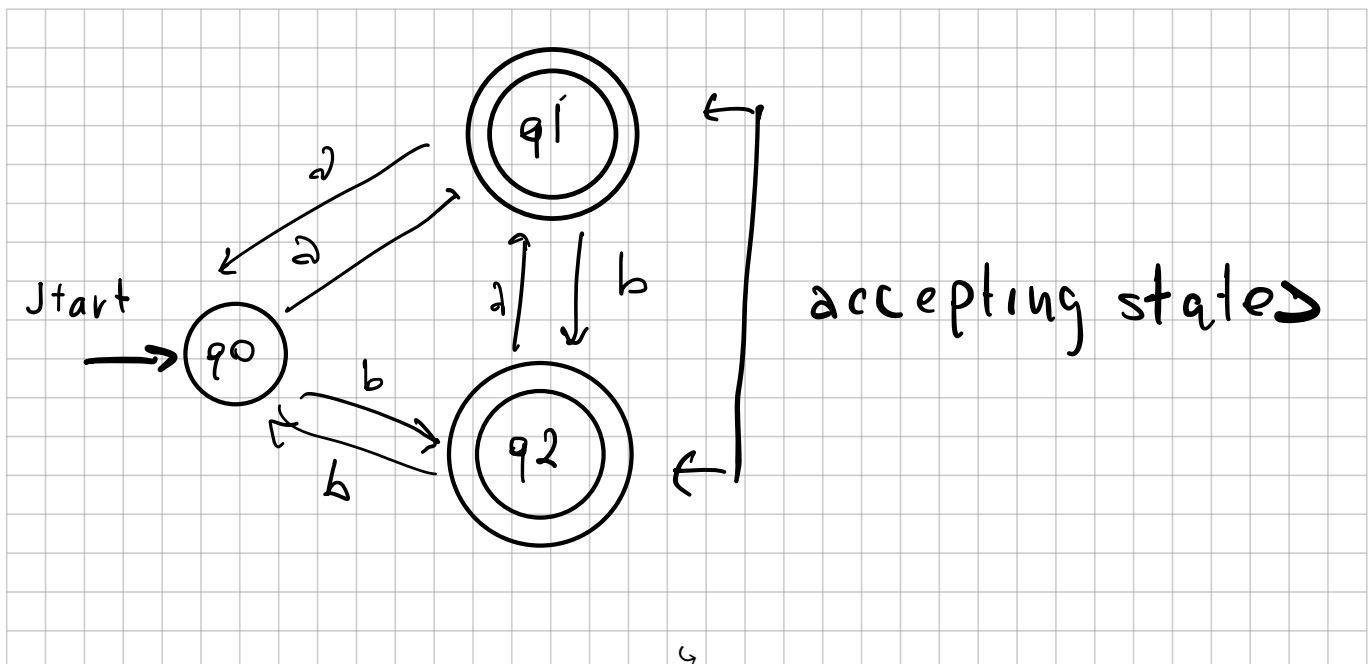
4p **4a** Explain the concept of closure properties of regular languages.


8p **4b** Let  $\Sigma = \{a, b\}$  and let  $L = \{ w \in \Sigma^* \mid w \text{ is a nonempty string whose characters alternate between a's and b's} \}$ . Design a DFA whose language is  $L$ .

Some example inputs for this automata:

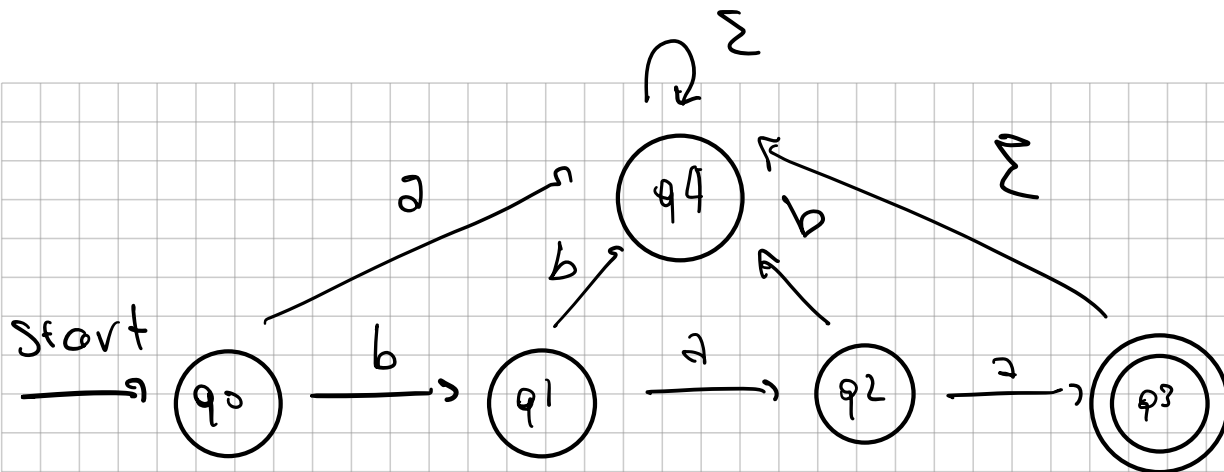
**Valid** - ababababa

**Invalid** - abaa



2

6p **4c** Let  $\Sigma = \{a, b\}$  and let  $L = \{baa\}$ . Design a DFA for  $L$ .





**Computer Networks**

4p

**5a**

Explain what is IPv4. Why was there a need to move from IPv4 to IPv6?


6p

**5b** What are the different types of IP addresses (static, dynamic) and where are they typically used?

Static address → they do not change (useful for web servers)
Dynamic address → they change frequently (common for phones, laptops)


4p

**5c** Why do we need a transport layer in TCP/IP? Name at least two protocols used in this layer

- Standardized end-to-end communication and data integrity; data segmentation for transfer. Protocols in this layer:  
TCP → handles multiplexing and seq., receives receipts and sends lost data again. UDP → less reliable, no info in datagrams

**Information Security**

4p **6a** Describe the process of Two-Factor Authentication (2FA). Explain how it adds an additional layer of security compared to single-factor authentication.


4p **6b** Explain how Social Engineering attacks occur. Include examples and discuss preventive measures that can be taken.


- 4p **6c** Describe a type of attack a hacker might perform to steal your data. In your answer, you should include: The name of the attack, a short description of the attack and Why this type of attack could be bad for a user

Phishing attack

**Project (JavaCraft)**

As a part of this course, you worked on a group project titled **JavaCraft**. In the following questions (7a, 7b and 7c), you should provide answers based on your work on the project.

2p **7a** In order to get which flag to draw, you had to call a function to interact with a website. Can you name this function (or the command you would enter to invoke this function)? If your group did draw a flag, please name the flag you drew.


2p **7b** You had to design a Finite State Automata as a part of your secret door logic, can you draw the FSA you submitted with your project (the FSA does not have to be accurate, we will accept it as a valid solution as long as it somewhat resembles your submission).



2p

**7c** Can you name the new blocks you included in your source code?
