



Class: BCS – 4 A & B
Subject: CSC312 - Theory of Automata
Instructor: Osama Subhani Khan

Total Marks: 25
Time allowed: 90 Min
Date: 18-Apr-2025

NOTE: All questions should be solved (no choice). Answers should be precise.

(CLO1) Describe the fundamental concepts of automata and formal language theory.

Q.1. Consider the language S^* , where $S = \{aa\ aba\ baa\}$.

[1+2+2=5 Marks]

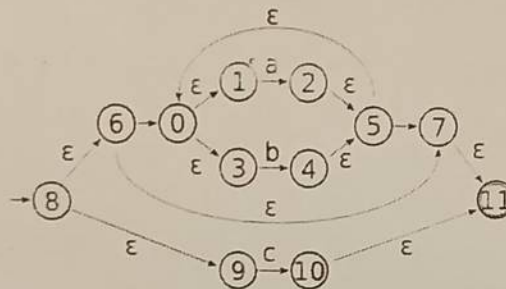
- 1.1 Show that the words $aabaa$, $baaabaaa$ and $baaaaaababaaaa$ are all in this language.
- 1.2 Can any word in this language be interpreted as a string of elements from S in two different ways?
- 1.3 Can any word in this language have an odd total number of a 's?

(CLO2) Design different types of automata along with inter-conversion between their equivalent representations.

Q.2.

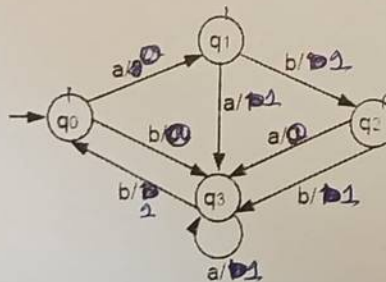
[2+4+5=11 Marks]

2.1 What is the language accepted by the following Non-Deterministic Finite Automaton with epsilon.



2.2 Design the equivalent Moore machine after converting the following Mealy machine. Write the output of the string ~~0101~~ for both machines.

$abab$



2.3 How can the working of an ATM machine be represented as a finite state machine?

Q.3. Prove that the following language is irregular using pumping lemma.

$$L = \{a^n b^{2n}\}$$

[4 Marks]

Q.4. Prove the following theorem by using lemmas.

$$L(a(b^* + c^*)) = L(ab^* + ac^*)$$

[5 Marks]

END