



COMSATS UNIVERSITY ISLAMABAD (CUI)

Park Road, Tarlai Kalan Islamabad 45550 Pakistan

Department Of Computer Science.

Mid-Term Examination. Fall - 2024.

Subject: Theory Of Automata

Program: B.S. (C.S.)

Semester: IV- A & B

Date: 06 / 11 / 24

Course Code: CSC-312

Total Marks: 25

Time Allowed: 80 Minutes

Instructor: Salman Aslam & Osama Subhani

NOTE: 1) ALL QUESTIONS SHOULD BE SOLVED.(NO CHOICE).
2) ANSWERS SHOULD BE PRECISE.

(CLO1) Design various kinds of automata along with interconversion among equivalent notations.

Q. 1

[4 Marks]

Design a Mealy Machine to represent a traffic light control system. Specifications of the system are as follows:

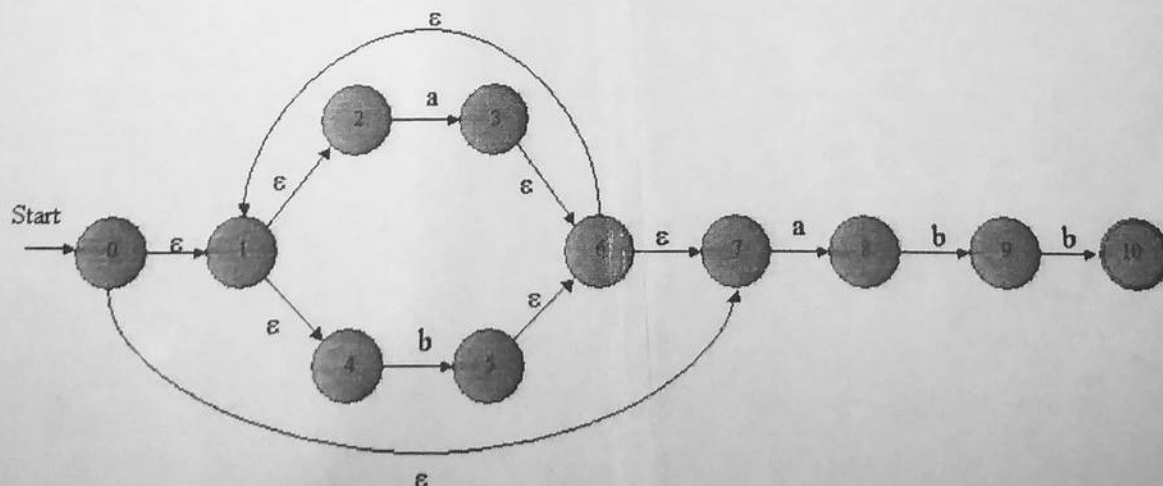
The system starts with the green light turned on as output. Once a light is turned on, it should stay that way for a certain minimum time, say 10 seconds, and then only change when a car comes up or time expires. Green will be changed to Yellow to Red when timer expires. And Red will change to Orange to Green if timer expires or there is a car at the front.

Q. 2

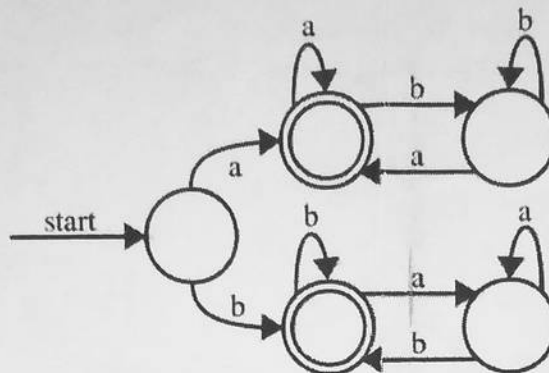
[3.5+3.5=7 Marks]

a) Convert the following Non-Deterministic Finite Automata to Deterministic Finite Automata.

$(a + b)^*abb$



b) What is the language of the following Deterministic Finite Automata?



(CLO2) Construct grammar and model for different languages.

Q. 4

[4 Marks]

Prove that:

$$L((a + b)c) = L(ac + bc)$$

Q.5

[2.5 + 2.5 = 5 Marks]

i. Show that the grammar

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

is ambiguous.

ii. Eliminate useless productions from

$$S \rightarrow a \mid aA \mid B \mid C$$

$$A \rightarrow aB \mid \epsilon$$

$$B \rightarrow Aa$$

$$C \rightarrow cCD$$

$$D \rightarrow ddd$$

Q.6

[5 Marks]

Reduce the given CFG with Productions given by

$$S \rightarrow abSb \mid a \mid aAb \quad \text{and}$$

$$A \rightarrow bS \mid aAAb$$

to Chomsky Normal Form (CNF).

THE END