# Indian Institute of Information Technology Sri City, Chittoor

## Theory of Computation – Spring 2024

## Mid 1 Examination

Duration: 90 Minutes

Maximum Marks : 60

- It is a closed book exam.
- No electronic devices, books, any kind of material is allowed.

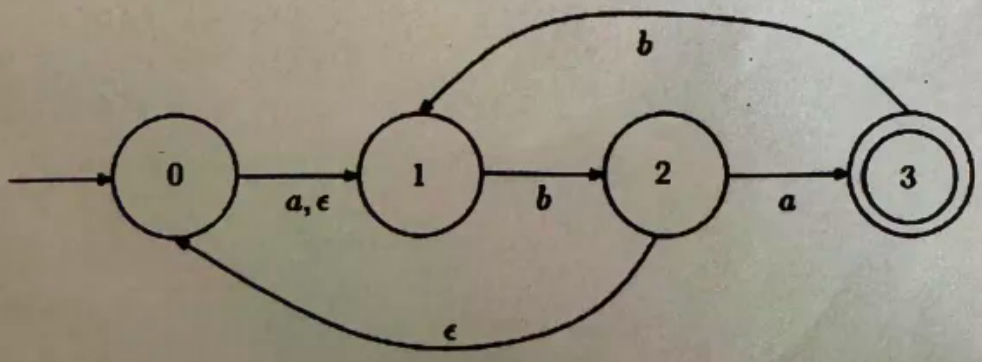
1. (a) While it is true that union of two regular languages is a regular language, the following statement is false. "Union of two non-regular languages is a non-regular language. " Can you disprove this statement? [5 Marks]

   (b) Let $L_1, L_2, and\ L_3$ are languages over an alphabet $\Sigma$. Consider the statement : If $L_1, L_3$ are regular and $L_1 \subseteq L_2 \subseteq L_3$ , then $L_2$ is regular. Prove or disprove this statement. [5 Marks]

   (c) Construct a DFA for binary numbers divisible by 3 but not by 2. {Construct a DFA for binary numbers divisible by 3 and and a DFA for binary numbers not divisible by 2; then construct the product machine} [10 Marks]

2. (a) Prove or disprove P(QR)*= (PQ)*R [5 Marks]

   (b) Convert the following NFA to an equivalent DFA. **[5 marks]**




   (c) Convert the following DFA into a regular expression by applying state elimination method discussed in the class. Eliminate states in the order 1,2,3... **[10 marks]**