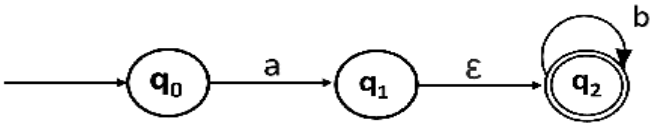
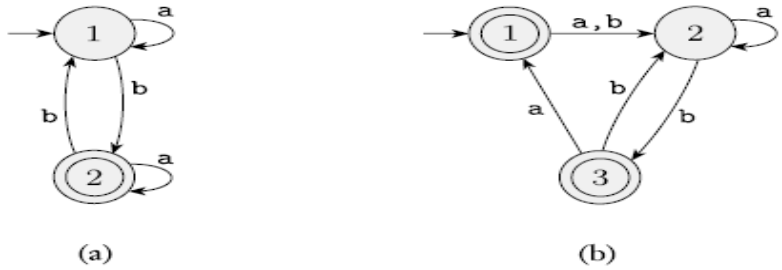
	ITER, SIKSHA 'O' ANUSANDHAN (Deemed to be University)		Assignment
Branch	**CSE/CSIT**	Programme	**B.Tech**
Course Name	**Introduction to the Theory of Computation**	Semester	**5th**
Course Code	**CSE3731**	Academic Year	**2023-24**

ASSIGNMENT - 1

Submission due date: 13 /11/2023

Learning Level (LL)			
	L1: Remembering	**L3:** Applying	**L5**: Evaluating
	L2: Understanding	**L4**: Analysing	**L6**: Creating

Q's	Questions	COs	LL
1	In theoretical computer science, how important are computing theory and complexity theory? Describe their differences and how they are related to one another.	**CO1**	**L1,L2**
2	A graph G is said to be k-regular if every node in the graph has degree k. a) Construct a 3-regular graph G = (V, E) with 12 nodes. Display the vertex set V and edge set E of the graph G. b) Write down the formula by using which you constructed the edges for graph G.	**CO1**	**L1,L2**
3	Construct the DFA for the following languages. a) The language accepting all the strings such that last two symbols must be same over input alphabets Σ={a,b}. b) The language accepting all the strings that ends with 3 a's or 3 b's over input alphabets Σ = {a, b}.	**CO2**	**L2, L3,L4**
4	Draw the state transition diagram and show the state transition table for the following DFA's. a) DFA for the language accepting all strings that contains atleast 2 a's and exactly 2 b's over input alphabets Σ = {a, b}. b) DFA for the language accepting strings containing neither '00', nor '11' as substring over input alphabets ∑ = {0, 1}.	**CO2**	**L2,L3,L4**
5	a) Convert the following NFA with ε to NFA without ε.  b) Convert the obtained NFA to its equivalent DFA.	**CO2**	**L3,L4**
6	a) Design an NFA that recognizing the language (01 U 001 U 010)* b) Convert this NFA to an equivalent DFA. Give only the portion of the DFA that is reachable from the states.	**CO2**	**L2, L3,L4**
7	Prove that the class of Regular Languages is closed under a) Union, b) Concatenation, and c) Kleene Closure	**CO2**	**L2,L3**
8	a) Let Σ = {a, b}. Write regular expression to define language consisting of strings w such that, w of length even. b) Let Σ = {a, b}. Write regular expression to define language consisting of strings w such that, w of length odd.	**CO2**	**L3,L4**

9	Convert the following finite automata to regular expression.  	**CO2**	**L3,L4**
10	Design the Finite Automata for the following Regular Epressions: i) R1= Φ ii) R2= ϵ iii) R3= a^+ iv) R4= $(ab)^*ab^*$ v) R5=0^*1^*	**CO2**	**L3,L4**

Course Outcomes	By the end of the course, through lectures, readings, home works, assignments, and exams, students will be able to:	
	CO1	Enhance/develop ability to understand and conduct mathematical proofs for computation and algorithms.
	CO2	Design and analyze finite automata and regular expression for describing regular languages.
	CO3	Design and analyze pushdown automata, and context-free grammars.
	CO4	Design and analyze Turing machines.
	CO5	Enhance the ability to understand the decidability, undecidability, and reducibility criteria of various computational problems.
	CO6	Demonstrate the understanding of key notions, such as algorithm, computability and complexity through problem solving.

- ✓ *Assignment scores/markings depend on neatness and clarity.*
- ✓ *Plagiarized assignments will be given a zero mark.*
- ✓ *Submit the hard copy of your assignment by the due date, i.e. 13.11.2023*
- ✓ *Submit the assignment handwritten on A4 size papers and spirally bound to your ITC class teacher. A front page must be present containing the details of the subject, the assignment and the student. Furthermore, on the top of each program, you must mention your full name, registration number, title of the program and date.*