Code No: R1922055 **R19** SET - 1

II B. Tech II Semester Regular Examinations, August/September - 2021
FORMAL LANGUAGES AND AUTOMATA THEORY
(Computer Science and Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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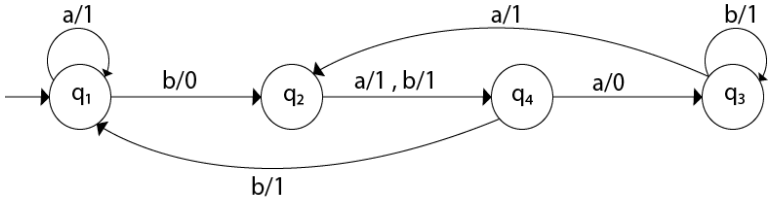
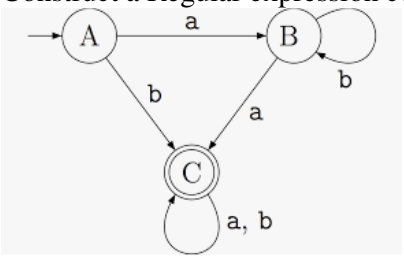
1	a)	Why do we need to study automata theory and formal languages?	4M
	b)	Define NFA with ∈- moves and give example.	4M
	c)	Depict the steps in converting an NFA with ∈ into NFA without ∈ with an example.	7M

Or

2	a)	Design a DFA L(M) = {w | w ε {0, 1}*} and W is a string that does not contain consecutive 1's.	8M
	b)	Convert the following Mealy machine into equivalent Moore machine.	7M



3	a)	Write the regular expression for the language L over ∑ = {0, 1} such that all the strings i) do not contain the substring 01. ii) should have at least one 0 and at least one 1.	8M
	b)	Construct a Regular expression corresponding to the following finite automata.	7M



Or

4	a)	Prove that the language L = { a^{2n} b^{3n} a^{n} | n≥0} is not regular.	10M
	b)	What is Chomsky hierarchy? explain with diagram.	5M
5	a)	Consider the CFG with {S,A,B) as the non-terminal alphabet, {0,1) as the terminal alphabet, S as the start symbol and the following set of production rules S → A1B A → 0A / ∈ B → 0B / 1B / ∈ For the string w = 00101, find the Leftmost derivation, Rightmost derivation, and Parse Tree.	5M
	b)	Show that language L = { WW | W belongs to {a, b}* } is not context free.	10M

Or

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6	a)	Define Context Free Grammar. State and Explain the closure properties of CFG.	5M
	b)	Consider the CFG with {S,A,B) as the non-terminal alphabet, {a,b, ε) as the terminal alphabet, S as the start symbol and the following set of production rules $S \rightarrow ASA \mid aB \mid b$ $A \rightarrow B$ $B \rightarrow b \mid \in$ Convert the given grammar into CNF	10M
7	a)	Describe the components of Push Down Automata.	5M
	b)	Construct a PDA from the following CFG. G = ({S, X}, {a, b}, P, S) where the productions are given below. $S \rightarrow XS \mid \in$, $A \rightarrow aXb \mid Ab \mid ab$	10M

Or

8	a)	Design a PDA for accepting a language $\{a^n b^{2n} \mid n>=1\}$.	10M
	b)	Is a push-down automaton with two stacks equivalent to a turning machine? Justify your answer with proper explanation.	5M
9	a)	Construct Turing machine for $L = \{a^n b^m a^{(n+m)} \mid n,m \geq 1\}$	10M
	b)	Explain in brief about Church's Turing thesis.	5M

Or

10	a)	Describe the closure properties of recursive and recursively enumerable langauges.	8M
	b)	Explain the differences between NP complete and NP-hard problems.	7M