Roll No. | | | | | | | | | | |

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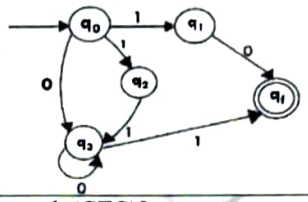
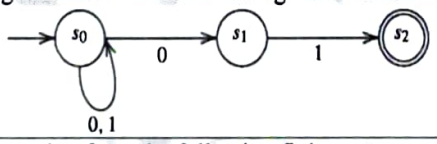
COER University

END SEMESTER EXAMINATION, EVEN SEM 2022-23

Time : 3 hours **Total Marks** : 100
Program Name : B.Tech.(Honors)-CSE, CSE(AI&ML,CSE(Cyber Security) **Semester** : IV
Course Name : Theory of Automata and Formal Languages **Course Code** : SOC204

Note: All questions are compulsory. No student is allowed to leave the examination hall before the completion of the time.

Q. No 1	Attempt Any Four Parts. Each Question Carries 5 Marks.	CO	BL
(a)	Briefly discuss about Finite Automata with Epsilon- Transitions.	CO 1	2
(b)	Design a DFA which accepts set of all strings which are divisible by 5 for binary alphabet.	CO 1	6
(c)	Find the regular expression from the given FA. 	CO 1	3
(d)	What do you understand by a generalized transition graph (GTG)?	CO 1	1
(e)	Prove that regular set $L=\{a^k \mid k \text{ is a prime number}\}$ is not regular.	CO 1	6

Q. No 2	Attempt Any Four Parts. Each Question Carries 5 Marks.	CO	BL
(a)	Construct the regular grammar from the following finite automata. 	CO 2	3
(b)	Obtain the regular expression from the following finite automata.	CO 2	1
(c)	Define Regular Expression? Explain about the Properties of Regular Expressions.	CO 2	2
(d)	Design a Mealy Machine that prints "a" whenever the sequence "01" is encountered in any input binary string.	CO 2	6
(e)	Evaluate the regular grammar that generates the language {w | w contains an even number of 0s} over $\sum=\{0,1\}^*$.	CO 2	5

Q. No 3	Attempt Any Four Parts. Each Question Carries 5 Marks.	CO	BL
(a)	Explain about Ambiguity in Grammars and Languages with example.	CO 3	2
(b)	What are the decision problem of CFLs? Explain each problem.	CO 3	1
(c)	Simplify the following grammar. S→AB|BC|aACb|a, A→AAB|BD|abD|C, C→CA|S|a, D→d, E→ab	CO 3	5
(d)	Define Chomsky Normal Form (CNF). Convert the following grammar to CNF S->0S0|1S1| ∈.	CO 3	2
(e)	Construct CFG without ε – production from the one which is given below S → a | Ab | aBa A → b | ε B → b | A	CO 3	6

Q. No 4	Attempt Any Two Parts. Each Question Carries 10 Marks.	CO	BL
(a)	Convert the grammar S->0AA, A ->0S/1S/0 to a PDA that Accepts the same Language by Empty Stack.	CO 4	3
(b)	Define the Concept and working of a PDA. Why can't we use queue data structure in PDA as an auxiliary memory?	CO 4	5
(c)	Construct a PDA accepting $\{a^n b^m a^n \mid m, n \geq 1\}$ by null store. From the PDA construct the corresponding CFG.	CO 4	5

Q. No 5	Attempt Any Two Parts. Each Question Carries 10 Marks.	CO	BL
(a)	Give the correspondence between P, NP and NP-complete problems.	CO 5	4
(b)	Write short notes on the following: (1) UTM. (2) Church-Turing thesis (3) Recursive language	CO 5	5
(c)	Construct a Turing Machine that will accept the Language consists of all palindromes of 0's and 1's?	CO 5	6

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