(Please write your roll no. here) *Exam Roll No.....*

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] July 2023

Paper Code- ETCS 206	**Subject: Theory of Computation**
Time: 3 Hours	**Maximum Marks:75**

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit.

Q1 Attempt all questions: **(5x5=25)**

(a) State the differnces between a NFA and DFA?
(b) Differentiate between Moore and Melay Machines?
(c) Find a regular expression corresponding to the language of all strings over the alphabet { a, b } that contain exactly two a's.
(d) State Church's hypothesis about compuitability of a machine
(e) Prove that the graph coloring problem is NP-complete

UNIT-I

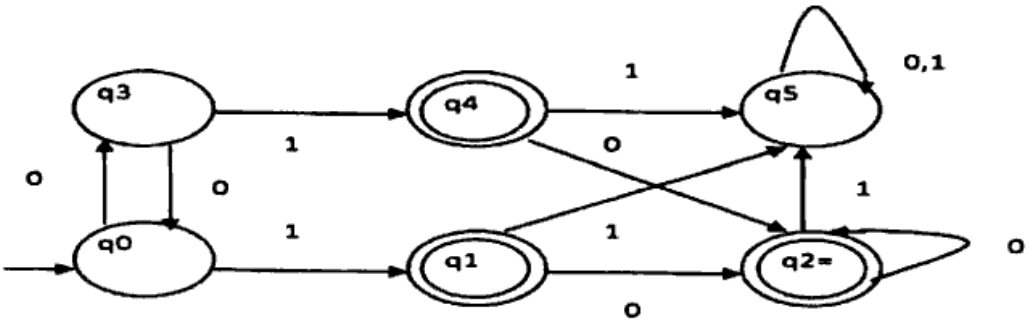
Q2 a) Let Σ = {a, b} and let L = { w $\in \Sigma^*$ | w $\neq \varepsilon$ and the first and last character of w are the same }. Design aDFA for L **(6)**

b) For the following NFA. Convert it into its equivalent DFAwhere Q0 is the initial state and Q2 is the final state. **(6.5)**

	a	b
Q0	{Q0}	{Q0,Q1}
Q1	€	{Q2}
Q2	€	€

Q3 a) Prove the pumping lemma for regular lanuages with examples. **(6)**

b) Minimize the following DFA over alphates as 0,1 **(6.5)**



UNIT-II

Q4 a) What are inherently ambiguous languages. Check whether the folllowing Grammar is Ambiguous or not-S->A/B, A->aAb /ab, B->abB/ € **(6)**

P.T.O.

b) What are the steps to simplify a Context Free Grammar. Simplify the following CFG:
S->AbaC, A->BC, B->b/€, C->D/€, D->d **(6.5)**

Q5 a) What is PDA. Construct a pda to find 2's complemet of a binary number. **(6)**

b) Covert the following grammar into Chomsky Normal Form:
S->ABCa, A->aAbb, A->e, B->bB, B->b, B->AC, C->aCa, C->e **(6.5)**

UNIT- III

Q6 a) Design a Turing Machine for the language $\{ a^n b^n c^n \mid n>=1 \}$ **(6)**

b) Design a Turing Machine to check if a set of parenthesis is well formed. **(6.5)**

Q7 a) State and prove the halting problem of Turing Machines **(6)**

b) Explain the Closure properties of Recursive Languages **(6.5)**

UNIT- IV

Q8 a) State and prove the Savitch theorem. **(6)**

b) Differentiate between P, NP, NP-hard and NP-complete problems with examples. **(6.5)**

Q9 a) State and prove the Cook's theorem. **(6)**

b) Is PSPACE harder than NP? How can you show a problem in PSPACE. **(6.5)**

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