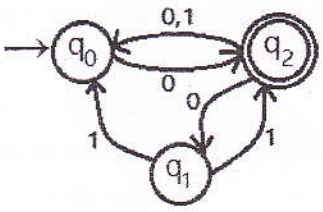
Year and Program:2018-19 | **School of Technology** | **Department of Computer Science & Engineering**

Course Code: CST202 | **Course Title: Theory of Computation** | **Semester – IV**

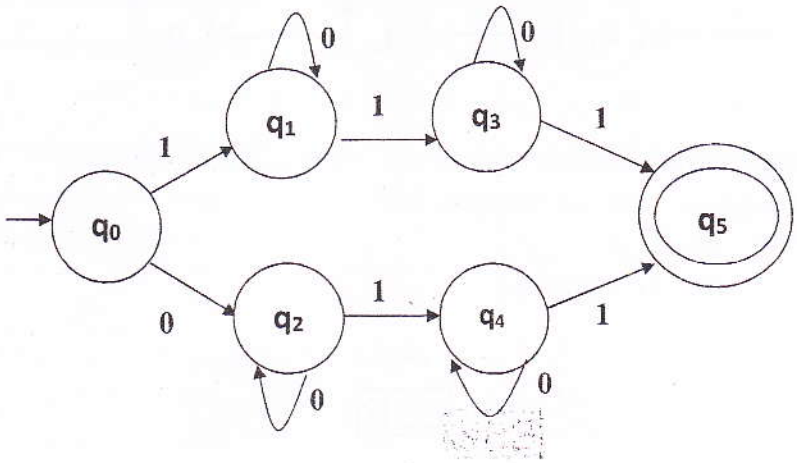
Day and Date: Tuesday 21st May2019 | **End Semester Examination (ESE)** | **Time:** 10:30AM to 01:30PM **Max Marks: 100**

Instructions:
1) All questions are compulsory.
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks.

Q.1	**Attempt the Following**	Marks	Bloom's Level	CO
a	Describe Nondeterministic Finite Automata with suitable Example and define extended transition function for NFA.	07	L1	CO1
	OR			
a	Convert the following NFA to DFA	07	L2	CO1



b	State and Prove the Kleene's Theorem Part – I	08	L1	CO1
	OR			
b	Convert the minimum state FA for given FA.	08	L2	CO1



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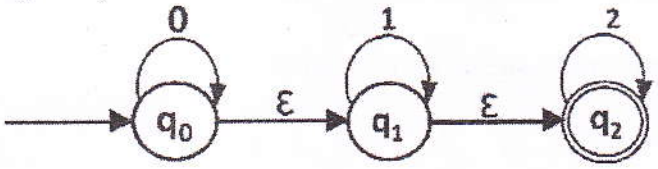
Q.2	**Attempt the Following**			
a	Convert the following CFG to Chomsky Normal Form. S → AACD A → aAb | ^ C → aC | a D → aDa | bDb | ^	07	L2	CO2
	OR			
a	1) Simplify the following Context Free Grammar 1) S -> ABAC A -> aA / ^ B -> bB / ^ C -> c 2) Find out the useless and dead variables S -> abS | abA | abB A -> cd B -> aB C -> dc	07	L2	CO2
b	Describe the model and working of the automaton machine acceptor for the Context free language.	08	L1	CO3
	OR			
b	Design a PDA for language of a palindrome over an $\sum=\{a,b\}^*$	08	L4	CO3
Q.3	**Solve any two**			
a	Design the equivalent NFA.  	07	L4	CO1
b	Apply Kleene's theorem to obtain the NFA - ^ Null for the following regular expressions 1) (00+1) * (10) * 2) (0+1) * (1+00) (0+1) *	07	L3	CO1

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c	Give the left most derivation and right most derivation for the strings i)bbbaa ii)abb for the given CFG and specify your view on ambiguity of a given grammar. $S \rightarrow SSa \mid SaS \mid aSS \mid b$.	07	L2	CO2
d	Design a PDA for $L = \{WcWr \mid W \in \{a, b\}^*\}$	07	L4	CO3
Q. 4	**Solve Any Two**			
a	Describe the parsing of a string **abbcde** for the top down parser and shift reduce parser for the given context free grammar: $G= (V, \sum, P, S)$, where $V= \{S, A, B\}$, $\sum = \{a, b, c, d, e\}$, $S = \{S\}$ P= {S -> aABe A -> Abc | b B -> d}	08	L1	CO2
b	Describe the moves and construct a Top down PDA for following CFG $S \rightarrow a \mid aS \mid bSS \mid SbS \mid SSb$	08	L2	CO3
c	State and prove the pumping lemma for context free language.	08	L1	CO4
Q. 5	**Solve Any Two**			
a	Design the Turing Machine for the language L={a,b}* {aba} {a,b}* = {x belongs to {a,b}* | x contains the substring aba)	08	L4	CO5
b	State the need for the variations in the Turing machine.	08	L3	CO5
c	Design the Turing Machine for the language $L = \{a^i b^j c^i \mid i, j, k>=0\}$	08	L4	CO5
Q. 6.	**Solve Any Three**			
a	L1 and L2 are two context free languages are there, show that these two languages are closed under the i) Union and ii) Concatenation operations.	08	L3	CO4
b	Show that $L = \{a^i b^i c^j \mid j>=i\}$ is not a Context free language.	08	L3	CO4
c	Design a TM to accept a language $L = \{a^n b^n \mid n>=1\}$	08	L4	CO5
d	Describe Turing suggested Universal Model of TM to resemble the working of the modern computer.	08	L2	CO5