Academic Year (2021-22)
Year: 2   Semester: IV

Program: B. Tech. (Computer Engg.)

Subject: Formal Language and Automata Theory

Date: ~~01/07/2022~~
04/10/2022

Max. Marks: 75

Time: 10:30 am to 1:30 pm

Duration: 3 Hours

~~RE~~ **REGULAR EXAMINATION**

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.

(1) This question paper contains 02 pages.
(2) **All Questions are Compulsory.**
(3) All questions carry equal marks.
(4) **Answer to each new question is to be started on a fresh page.**
(5) **Figures in the brackets on the right indicate full marks.**
(6) **Assume suitable data wherever required, but justify it.**
(7) Draw the neat labelled diagrams, wherever necessary.

Question No.		Max. Marks
Q1 (a)	Design FSM to check whether the given ternary number is divisible by 5.	[05]
Q1 (b)	Design Moore machine to change each occurrence of "1000" to "1001" over $\Sigma = \{0,1\}$ OR Construct NFA from r=(0+1)* (00+11) and convert into min DFA.	[10]
Q2 (a)	Convert CFG in to CNF: A -> aBa | bBa B -> aB | bB | ϵ	[08]
Q2 (b)	Define CFG and construct a CFG for $a^{2n}b^n$. **OR** Let G be the grammar. Find the leftmost derivation, rightmost derivation and parse tree for the expression a*b + a*b G: S -> S + S | S * S S -> a | b	[07]
Q3 (a)	Design PDA for recognizing: L= $\{a^n b^m a^n \mid m,n \geq 1\}$ **OR** Design PDA for recognizing : L = $\{ 0^m 1^n 0^{m+n} \mid m,n \geq 1\}$	[07]
Q3 (b)	Design TM for recognizing even palindrome.	[08]
Q4 (a)	Prove using pumping lemma L= $\{a^i b^i \mid i \geq 1\}$ is not regular	[10]

	OR Find the regular expression equivalent to the following transition diagram using Arden's theorem. 	[10]
Q4 (b)	Write regular expression to denote a language L which accepts all the strings which being or end with either 00 or 11 and draw NFA for the same.	[05]
Q5 (a)	Explain halting problem of a Turing machine. **OR** Write a short note on Universal Turing Machine.	[10]
Q5 (b)	Explain and classify languages based on their power.	[05]

All the Best!