Internal Assessment Question Paper – 2

M.S. Ramaiah Institute of Technology
(Autonomous Institute, Affiliated to VTU)
Department of CSE

Term: April – Jul 2024
Course Code: CS45

Programme: B.E
Course: Finite Automata and Formal languages
Sem: IV
Max Marks: 30

CIE: II
Time: 1Hr

Section: A,B,C
Portions for Test: L9-L28

Instructions to Candidates: Mobiles, smart watches or any electronic gadgets are strictly banned.
Question 1 is compulsory. Answer any one from question 2 and 3.

Sl #		Question	Marks	Bloom's Level	CO Mapping
1	a)	Obtain a CFG to generate the following language i. $L = \{ww^R \mid w \in \{a, b\}^*\}$ ii. $L = \{0^i 1^j 0^k \mid j > i+k \ \ i,k >= 1\}$	4	Apply	CO3
	b)	Obtain the grammar in CNF $S \rightarrow 0A \mid 1B$ $A \rightarrow 0AA \mid 1S \mid 1$ $B \rightarrow 1BB \mid 0S \mid 0$	4	Apply	CO4
	c)	Define Turing Machine. Obtain a Turing Machine to accept the language $L = \{0^n 1^{2n} \mid n >= 1\}$. Simulate for ID: 001111.	7	Apply	CO5
2	a)	Obtain a PDA for the given CFG $S \rightarrow ABC \mid bD$ $A \rightarrow BC \mid a$ $B \rightarrow bA \mid b$ $C \rightarrow d$	5	Apply	CO3
	b)	Is the following grammar ambiguous? $S \rightarrow aSbS$ $S \rightarrow bSaS$ $S \rightarrow \varepsilon$	5	Apply	CO3
	c)	Prove that if L is CFL and R is regular languages, then so is $L \cap R$ is a CFL	5	Apply	CO4
		OR			
3	a)	Obtain a PDA for language $L = \{a^n b^n c^{n+m} \mid n,m >= 0\}$. Simulate the PDA for ID: abcc.	7	Apply	CO3
	b)	Eliminate all ε production for the grammar $S \rightarrow ABC \mid bD$ $A \rightarrow BC \mid b$ $B \rightarrow b \mid \varepsilon$ $C \rightarrow c \mid \varepsilon$	4	Apply	CO4

	$D \rightarrow d$			
c)	Eliminate all unit production for the grammar $S \rightarrow AB$ $A \rightarrow a$ $B \rightarrow C\|b$ $C \rightarrow D$ $D \rightarrow E\| bC$ $E \rightarrow d\|Ab$	4	Apply	CO4

Outcomes meant to be assessed by the IA Test-I:
- CO3: Convert among equivalently powerful notations for a language, including amon DFAs, NFAs, and regular expressions, between PDAs, CFGs and normal forms of CFGs
- CO4: Prove the various closure and decision properties of formal languages.
- CO5: Explain the concepts of Undecidability, RE languages and Post Correspondenc problem.