Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Fourth Semester

Information Technology

CS3452 - Theory of Computation

(Common to Computers Science and Engineering)

Regulations - 2021

Duration : 3 Hrs *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

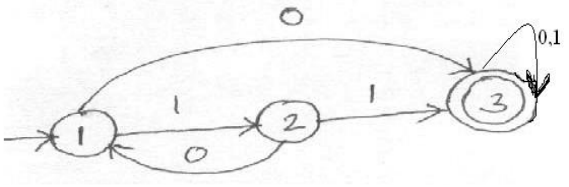
Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Differentiate between Non-deterministic and deterministic finite automata.	L2	1	2
2.	Define Epsilon closure of a state. Give example.	L2	1	2
3.	Formulate a regular expression for the language accepting strings which are starting with '1' and ending with '0' over the set ∑ = {0, 1}.	L3	2	2
4.	List the closure properties of regular languages.	L1	2	2
5.	Obtain the parse tree for the string *aaabbabbba* generated by the grammar: S→aB/bA, A→a/aS/bAA , B→b/bS/aBB.	L3	3	2
6.	Give instantaneous description of PDA.	L2	3	2
7.	Identify the type of grammar whose productions are of the form A →BC, A→a, C→ab.	L4	4	2
8.	Define Turing machine.	L2	4	2
9.	Give the properties of recursively enumerable sets which are undecidable.	L1	5	2
10.	What do you mean by universal turning machine?	L2	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a i	Prove that in principle of induction k2 = n(n+1)(2n+1) / 6.	L3	1	8
	ii	Prove that a language L is accepted by some ε – NFA if and only if L is accepted by some NFA without ε –transition.	L3	1	8
		Or			
	b	Convert the following Non-deterministic finite automata into DFA.	L3	1	16

States	Inputs	
	0	1
→p	{p,q}	{p}
q	{r}	{r}
r	{s}	Ø
*s	{s}	{s}

12.	a	Compute regular expression for the set of all strings denoted by $R_{13}{}^{3}$ from the deterministic finite automata given below	L2	2	16



Or

	b i	Let r be regular expressions then prove that there exists an NFA with ϵ-transition that accepts L(r).	L2	2	8
	ii	Construct a NFA equivalent to the regular expression: i. $(0+1)^*(00+11)(0+1)$ ii. $(10+1)\ (0+1)\ (0+1))^*$	L2	2	8
13.	a i	Consider the grammar with productions S →A1B, A→ 0A/ε, B→ 0B/1B/ε. Solve using Left-most derivation, Right-most derivation and draw the parse tree for the string 00101.	L4	3	8
	ii	If G is a grammar S-> SbS / a, Show that G is a ambiguous.	L4	3	8

Or

	b i	Design PDA to accept the language L= $\{a^n b^m c^m d^n / m, n >=1\}$ by empty stack and by final state.	L4	3	8
	ii	Formulate Push-down automata for the following grammar: S→0S1/A, A→1A0/S/ ε	L4	3	8
14.	a	Determine GNF for the following grammar with productions: S→AB,A→BS/b, B→SA/a.	L3	4	16

Or

	b	Design a Turing machine to compute proper subtraction.	L3	4	16
15.	a i	Does the PCP with two lists x = {b, b, ab3, ba} and y = {b3,ba,a} have a solution.	L4	5	8
	ii	If a Language L and its complement LI are both recursively enumerable then show that L and LI are recursive.	L4	5	8

Or

	b	Obtain the code for <M,1011> where M = ({q1,q2,q3},{0,1},δ,q1,B,{q2}) have moves: δ (q1,1) = (q3,0,R) δ (q3,1) = (q2,0,R) δ (q3,0) = (q1,1,R) δ (q3,B) = (q3,1,L)	L4	5	16