Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH - DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Fourth Semester

Computer Science and Engineering

CS3452 - Theory of Computation

(Common to Information Technology)

Regulations – 2021

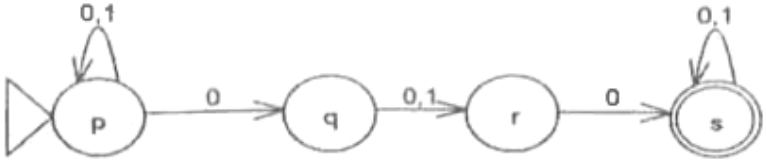
Duration : 3 Hrs ***Maximum : 100 Marks***

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

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Compare and contrast NFA and DFA.	L4	1	2
2.	Define ε–closure of a state.	L1	1	2
3.	Consider the following languages. L1 = { ab,abb,abbb, …} and L2 = Φ (empty language). Identify the list of strings that are part of the language created by L1 . L2 L2*.	L3	2	2
4.	State Pumping Lemma for regular languages.	L1	2	2
5.	When do you say that given grammar G is ambiguous?	L2	3	2
6.	Write a Context Free Grammar for the language consisting of equal number of a's and b's.	L6	3	2
7.	Define the language recognized by any Turing Machine.	L1	4	2
8.	Write the properties of CFL that are closed.	L1	4	2
9.	Write the significance of NP problems with an Example.	L2	5	2
10.	Why is the 3-CNF SAT problem important in computational theory?	L2	5	2

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

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	Draw a Deterministic Finite Automata recognizing (DFA) the language corresponding to the regular expression (ab + bc* a*) *. Test your DFA using any two strings of the language.	L3	1	16
		Or			
	b i	Find the equivalent DFA for the following NFA.	L3	1	8



	i i	Construct a DFA that accepts the string over an alphabet {0,1}, number of 0's is multiples of 3.	L3	1	8

12.	a	Find the Deterministic Finite Automata recognizing the language corresponding to the regular expression (0*10 + 1*0)(01*).	L5	2	16
		Or			
	b i	State that the language L = $\{0^n1^{2n} \mid n > 0\}$ is not regular.	L5	2	8
	ii	Prove if L and M are regular language, then so is L - M.	L5	2	8
13.	a	Develop a Pushdown Automata to recognize the language, L = $\{a^n b^p c^p d^{(n/2)} \mid p, n>0\}$. Justify your answer.	L3	3	16
		Or			
	b i	Grammar G: S ⟶ S1S | 0, Is this grammar G is ambiguous?	L3	3	8
	ii	Prove that if PDA P is constructed from CFG G, then L(P) = L(G).	L3	3	8
14.	a	Convert the following grammar to Chomsky Normal Form. S ⟶ AaA A ⟶ aaBa | CDA | CD B ⟶ bB C ⟶ Ca | D D ⟶ bD | €	L6	4	16
		Or			
	b i	Design a Turing Machine to compute multiplication of two positive integers.	L6	4	8
	ii	Design a Turing Machine to rcognize the language $\{0^n1^n0^n \mid n\geq1\}$.	L6	4	8
15.	a i	Find whether following language is recursively enumerable. Union of recursively enumerable languages.	L2	5	8
	ii	Find whether following language is recursively enumerable. L and complement of L are recursively enumerable.	L2	5	8
		Or			
	b	State whether the instances of Post Correspondence Problem (PCP) have a solution. The following are the instances with ∑ = {0,1}.	L2	5	16

Index	List A	List B
1	10	01
2	110	011
3	110	01
4	000	00
5	10	010

In case the PCP has a solution, describe the post-correspondence solution with justification.