

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Fourth Semester

Information Technology

CS3452- Theory of Computation

(Common to Computer 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.	Design DFA to accept string over $\Sigma = (0,1)$ with two consecutive 0's.	AP	1	2
2.	Give the difference between a DFA and NDFA.	UN	1	2
3.	Write the regular expression for the set of all strings of 0's and 1's not containing 101 as substring.	AP	2	2
4.	Derive a string "aababa" for the following CFG. $S \rightarrow aSX/b; X \rightarrow Xb/a$.	AN	2	2
5.	Define Chomsky hierarchy of language	RE	3	2
6.	Show that $L = \{a^p/p \text{ is prime}\}$ is not context free.	AP	3	2
7.	Define Turing Machine.	RE	4	2
8.	Write the closure properties of Context free languages.	RE	4	2
9.	Mention the difference between decidable and undecidable problems.	RE	5	2
10.	Define PCP.	RE	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)

Q.No	Questions	BLT	CO	Marks
11.	a Solve that "A language L is accepted by some DFA if and only if L is accepted by some NFA".	AP	1	13
	Or			
	b Construct it to a DFA, the following NFA.	AP	1	13

State/Input	0	1
$\rightarrow P$	{q,s}	{q}
*q	{r}	{q,r}
r	{s}	{p}
*s	{ $\emptyset$ }	{q,s}

12.	a i	Solve that Language to be not regular by pumping lemma with example.	AP	2	7
	ii	What is regular expression? Write a regular expression for a set of string that consists of alternating 0's and 1's.	AP	2	6
Or					
	b	Construct NDFA for given RE using Thomson rule. i) $a.(a+b)^*ab$ (5) ii) $(a.b)^*$ (4) iii) $(a+b)$ (4)	AP	2	13
13.	a i	Explain PDA. Give an example for a language accepted by PDA by empty stack.	UN	3	6
	ii	Illustrates PDA for the language $\{WCWR/W \in \{0,1\}^*\}$.	UN	3	7
Or					
	b	Convert the grammar $S \rightarrow 0S1 A$ $A \rightarrow 1A0 S \epsilon$ into PDA that accepts the same language by the empty stack. Check whether 0101 belongs to $N(M)$.	UN	3	13
14.	a	Express the following grammar G into Greibach Normal Form(GNF). $S \rightarrow XA BB$ $B \rightarrow b SB$ $X \rightarrow b$ $A \rightarrow a$	EV	4	13
Or					
	b	Construct a turing machine to accept palindrome in an alphabet set $\Sigma = \{a,b\}$. Trace the strings 'abab' and 'baab'.	EV	4	13
15.	a	What is universal turing machine? Bring out its significance. Also construct a TM to add two numbers and encode it.	UN	5	13
Or					
	b	Discuss the concept of P and NP problems with examples.	UN	5	13

*PART – C (Marks 1*15 = 15)*

Q.No	Questions		BLT	CO	Marks
16.	a i	Define pumping lemma for CFL. Show that $L = \{a^i b^j c^k, i < j < k\}$ is not context free and judge your answer.	UN	4	7
	ii	Write a short note on CNF with example.	UN	4	8
Or					
	b	Explain programming techniques in turning machine and briefly write subroutine concept with example.	UN	4	15