GIET UNIVERSITY, GUNUPUR – 765022

MCA (Second Semester Regular) Examinations, May – 2024

MCA23204- Theory of Computation

Time: 3hrs Maximum: 60 Marks

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	What is finite automata? What are its types.	Co1	K1
b.	Write the difference between the + closure and * closure.	Co2	K2
c.	Find out the language generated by the regular expression(0+1)*.	Co3	K1
d.	What is Instantaneous Descriptions (ID).	Co4	K1
e.	Name the four closure properties of RE.	Co2	K1

PART – B **(10 x5=50 Marks)**

Answer ***ALL*** questions		Marks	CO #	Blooms Level
2. a.	Define a language over an alphabet. Describe the concept of finite and infinite language with suitable examples.	5	Co1	K1
b.	Describe the Kleene star operation and Kleene plus operation on a language. Given the language L={ab, ba}, list the first 10 elements of $L^*$and L^+.	5	Co1	K2
	(OR)			
c.	Construct the NFA over {a, b} which accepts the strings having exactly 3 a's in it.	5	Co3	K3
d.	Construct the DFA to recognize odd number of 1's and even number 0's	5	Co3	K3
3.a.	Derive the corresponding Regular expression from the given DFA	5	Co3	K3

Q	δ(Q,a)	δ (Q,b)
→q_0	q_1	q_2
q_1	q_0	q_2
*q_2	q_2	q_2

b.	State and prove Arden's theorem.	5	Co2	K2
	(OR)			
c.	Construct a NFA that recognises the languages generated by the regular expression $(a|b)^*abb$.	5	Co3	K2
d.	Convert the given NFA to its equivalent DFA.	5	Co3	K3

Q	$\delta(Q,a)$	$\delta(Q,b)$
→A	{A}	{A,B}
B	{C}	{C}
*C	φ	φ

4.a.	What is ambiguity. Check whether the grammar G with production rules: X → X+X | X*X |X| a is ambiguous or not.	5	Co2	K2

b.	Find a reduced grammar equivalent to the grammar G, having production rules, P: S → AC | B, A → a, C → c | BC, E → aA | e	5	Co2	K2
	(OR)			
c.	Prove that L = $\{a^i b^i \mid i \geq 0\}$ is not regular.	5	Co2	K2
d.	Define finite state machine mathematically. Briefly explain all the components Basic model of FSM.	5	Co3	K1
5.a.	Convert the following CFG into CNF S→ XY | Xn | p X → mX | m Y → Xn | o	5	Co2	K2
b.	Design a PDA to accept $\{0^n1^n \mid n>1\}$.Draw the transition diagram for the PDA and **identify** the instantaneous description(ID)of the PDA which accepts the string '0011'.	5	Co4	K3
	(OR)			
c.	Convert the grammar G: S→a|aA|bB|ε A→aA| aS B→ $cS\|\varepsilon$ to a finite automata.	5	Co2	K2
d.	Construct a Turing machine that accepts the language L=$\{a^n b^n \mid n\geq 0\}$	5	Co4	K3
6.a.	List and describe the components of a PDA. Provide a detailed explanation of each component and its role.	5	Co4	K1
b.	Explain the basic model of Turing machine in detail.	5	Co4	K1
	(OR)			
c.	Consider the following ε–NFA. Compute the ε–closure ofeach state and find its equivalent NFA.	5	Co3	K3

	ε	a	b	C
→p	ϕ	{p}	{q}	{r}
q	{p}	{q}	{r}	ϕ
*r	{q}	{r}	ϕ	{p}

d.	Differentiate between NFA and DFA.	5	Co3	K2

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