b. A professor solved a problem in regular Language and represented transition table as follows — 10 | 3 | 1 | 1

	δ	a	b
→	q_0	q_1	q_3
	q_1	q_0	q_2
	q_2	q_3	q_1
	q_3	q_2	q_0

But the professor forgot to represent final sate. He said there is one final state only. He asked the students to use lottery method to select a state. So enumerate all possible languages for the above.

27. a.i. Explain the type of Grammar in detail with proper examples. — 5 | 2 | 2 | 2

ii. What is an ambiguous grammar? Explain with an example. — 5 | 2 | 2 | 2

(OR)

b. Construct an equivalent grammar G in GNF for the grammar G1 where — 10 | 3 | 2 | 3
G1 = ({S,A,B}, {a,b}, {a,b}, {S → ASB|∈, A → aAS|a, B → SbS|A|bb}, S)

28. a. Convert PDA to CFG, PDA is given by — 10 | 3 | 3 | 4
P = ({p,q}, {0,1}, {x,z}, δ q, z)
Where δ is given by
δ(p,1,z) = { (p,xz)}
δ(p,ε,z) = { (p,∈)}
δ(p,1,x) = { (p,xx)}
δ(p,0,x) = { (q,x)}
δ(q,1,x) = { (q,∈)}
δ(q,0,z) = { (p,z)}

(OR)

b. State pumping Lemma for CFL use pumping Lemma to show the language — 10 | 3 | 3 | 4
L = {$a^i b^j c^k$ / i < j < k}is not a CFL.

29. a. Describe the following TM and their working. Are they more powerful than the basic TM? — 10 | 2 | 4 | 5
(i) → Multi – tape TM
(ii) → Multi – Dimensional TM
(iii) → Two – way infinite tape TM

(OR)

b. Design TM M, to implement the function "Multiplication" using the subroutine 'copy'. — 10 | 3 | 4 | 5

30. a.i. Prove that if a Language is recursive if and only if it and its complement are both recursively enumerable. — 8 | 1 | 5 | 6

ii. Define: Diagonalization Language. — 2 | 1 | 5 | 6

(OR)

b. How an MPCP problem can be reduce the PCP? — 10 | 2 | 5 | 6

* * * * *

Reg. No.														

B.Tech. DEGREE EXAMINATION, MAY 2022
Fifth Semester

18CSC301T – FORMAL LANGUAGE & AUTOMATA
(For the candidates admitted from the academic year 2018-2019 to 2019-2020)

Note:
(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
(ii) **Part - B** should be answered in answer booklet.

Time: 2½ Hours — Max. Marks: 75

PART – A (25 × 1 = 25 Marks) — Marks | BL | CO | PO
Answer **ALL** Questions

1. What are the basic limitations of finite state Machine? — 1 | 1 | 1 | 1
(A) It cannot remember arbitrarily large amount of information (B) It cannot remember state transitions
(C) It cannot remember grammar for a language (D) It cannot remember language generated from a grammar

2. Pumping LEMMA LOGIC is derived from — 1 | 1 | 1 | 1
(A) Recursion (B) Iteration
(C) Divide and Conquer Technique (D) Pigeon Hole Principle

3. The equivalence of two finite Automata is defined when they — 1 | 1 | 1 | 1
(A) Have the same number of states (B) Have the same number of edges
(C) Have the same number of states and edges (D) Recognize the same set of Tokens

4. The regular language corresponding to L = {x∈(0,1)*/x ends with 0 and starts with 1} is — 1 | 2 | 1 | 1
(A) 1(0*+1*)* 0 (B) 0(0*1*)* 1
(C) 0(0*+1*)* 01 (D) 1(0*+1*) 0

5. If L is a regular language over ∑ = {a,b}, which one of the following language is not regular? — 1 | 2 | 2 | 1
(A) L. L^R = {xy/x∈L, y^R∈L} (B) {ww^R / w∈L}
(C) Prefix (L) = {$x \in \sum^*$/ $\exists x \in \sum^*(ie)\ xy \in L$} (D) Suffix (L) = {$y \in \sum^*$/ $\exists x \in \sum^*(ie)\ xy \in L$}

6. The word generated by the grammar, x→d|bB ; B →d|ccA; A→aab| ddB — 1 | 1 | 3 | 3
(A) bccddd (B) baab
(C) bccaa (D) bddd

7. Which of the following is not a preliminary steps in converting any CFG to CNF, 1 1 3 3
   (A) Elimination of Non-Generating symbols (B) Elimination of Not reachable symbols
   (C) Elimination of Epsilon Production (D) Elimination of all Technical symbols

8. P, Q,R, are three languages , If P and R are regular and if PQ = R, then 1 1 3 3
   (A) Q has to be regular (B) Q cannot be regular
   (C) Q need not be regular (D) Q has to be CFL

9. For S $\rightarrow$OS1| $\in$, $\sum$ = {0,1)*, which of the following is wrong for the language produced? 1 2 3 3
   (A) Non regular language (B) $0^n 1^n / n >= 0$
   (C) $0^n 1^n / n >= 1$ (D) Regular language

10. The minimum number of productions required to produce a language consisting of palindrome string over $\sum$ = {a,b} is 1 2 3 3
   (A) 5 (B) 7
   (C) 9 (D) 11

11. Which among the following is true for the statement. If there are strings R and T in a language L, so that R is prefix of T and R is not equivalent to T. 1 1 4 4
   (A) DPDA can accept L by an empty stack (B) No DPDA can accept L by an empty stack
   (C) L is regular (D) L is DPDA

12. Context free grammar is called Type 2 grammar because of _____ hierarchy 1 1 4 4
   (A) Greibach (B) Backus
   (C) Chomsky (D) Adam

13. The transition a PDA makes is additionally depended upon the 1 1 4 4
   (A) Input tape (B) Terminals
   (C) Non – terminals (D) Stack

14. If the PDA does not stop on an accepting state and the stack is not empty the string is : 1 1 4 4
   (A) Rejected (B) Goes into loop forever
   (C) Accepted (D) Complement

15. NPDA cannot recognize all the language recognized by 1 1 4 4
   (A) DFA (B) NDFA
   (C) TM (D) DPDA

16. Turing machine does not contains 1 1 5 5
   (A) Tape (B) Read / Write head
   (C) State (D) Stack

17. Turing machine operates over 1 1 5 5
   (A) Finite length tape (B) Infinite length tape
   (C) Stack (D) Depends on Algorithm

18. A multi-tape turing machine is _____ powerful than a single tape turing machine 1 1 5 5
   (A) Different (B) Less
   (C) More (D) Equal

19. In multi – head facing machine there are 1 1 5 5
   (A) More than one heads of the TM (B) More than one input tapes of TM
   (C) Similar to the basic model of TM (D) Multiple tracks in the input tape

20. If TM accepts all words of the languages L and reject or loop for other nods which are not in L, than L is said to be 1 1 5 5
   (A) Recursive (B) Non – Recursive
   (C) Recursive Enumerable (D) Non – Recursive Enumerable

21. Statement: If L id R.E., Lc needs to be R.E. Is it correct? 1 1 5 5
   (A) Yes (B) No
   (C) May be (D) Cannot predict

22. The decision problems is the function from string to 1 1 6 6
   (A) Char (B) int
   (C) Boolean (D) String

23. A problem is called _____ if its has an efficient algorithm for itself 1 1 6 6
   (A) Tractable (B) Intractable
   (C) Computational (D) Non – Computational

24. The number of states required to automate the question (ie) {a,b}* {aba} {a,b}*
   (A) 3 (B) 4
   (C) 5 (D) 6

25. Let L1 be a regular language, L2 be a deterministic content – free language and L3 a recursively enumerable, but not recursive, language, which is table? 1 1 6 6
   (A) L1 $\cap$ L2 is deterministic CFL (B) L3 $\cap$ L1 is recursive
   (C) L1 $\cup$ L2 is context free (D) L1 $\cap$ L2 $\cap$ is recursively enumerable

PART – B (5 × 10 = 50 Marks) Marks BL CO PO
Answer **ALL** Questions

26. a. Determine the equivalent DFA for the given NFA model defined by M. 10 2,3 1 1
   M = ({ q_1, q_2, q_3}, {0,1} δ, q_1, {q_2, q_3}) where δ is defined by,
   $\delta (q_1, 0) \Rightarrow \{q_2, q_3\}$
   $\delta (q_1, 1) \Rightarrow \{q_1\}$
   $\delta (q_2, 0) \Rightarrow \{q_1, q_2\}$
   $\delta (q_2, 1) \Rightarrow \emptyset$
   $\delta (q_3, 0) \Rightarrow \{q_2\}$
   $\delta (q_3, 1) \Rightarrow \{q_1, q_2\}$

(OR)