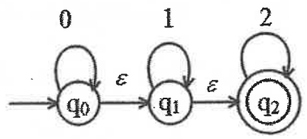
b. Convert the given ε-NFA to NFA



10 4 1 1

27. a. Convert the given CFG to CNF.
$S \rightarrow aSa \mid bSb \mid a \mid b$
Also write any one derivation for $W = abababa$.

10 4 2 2

(OR)

b. Convert the given CFG to GNF.
$S \rightarrow ABA$
$A \rightarrow aA / \varepsilon$
$B \rightarrow bB / \varepsilon$

10 4 2 2

28. a. Construct PDA to accept the following language L on $L = \{a^n b^{2n} \mid n \geq 1\}$

10 3 3 4

(OR)

b. Convert the following PDA to CFG.
$\delta(q_0, 0, z_0) = (q_0, XZ_0)$
$\delta(q_0, 0, X) = (q_0, XX)$
$\delta(q_0, 1, X) = (q_1, \varepsilon)$
$\delta(q_1, 1, X) = (q_1, \varepsilon)$
$\delta(q_1, \varepsilon, X) = (q_1, \varepsilon)$
$\delta(q, \varepsilon, z_0) = (q_1, \varepsilon)$

10 4 3 4

29. a. Construct TM for the language $\{WW^R / W in (0+1)^*$. Show table and prove by induction W=00111.

10 4 5 3

(OR)

b. Design TM for $F(X,Y) = X * Y$ where X,Y are stored in the tape in the form $1^X 0 1^Y 0$.

10 4 5 3

30. a. Explain the following with suitable examples
(i) NP problem
(ii) NP complete
(iii) NP hard type problem

10 3 6 4

(OR)

b. Find whether the list $M = (abb, aa, aaa)$ and $N = (bba, aaa, aa)$ have a post correspondence solution?

10 4 6 4

* * * * *

Reg. No.															

B.Tech(PT). DEGREE EXAMINATION, JANUARY 2023

Third Semester

19PCSC23T – FORMAL LANGUAGE AD AUTOMATA

(For the candidates admitted from the academic year 2019 – 2020 onwards)

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)

Answer **ALL** Questions

	Marks	BL	CO	PO
1. A regular language over an alphabet over an alphabet Σ is one that cannot be obtained from the basic languages using the operation is_____ (A) Union (B) Concatenation (C) Kleene (D) Positive	1	1	1	1
2. The number of elements in the set for the language $L = \{x \in (\Sigma r)^* \mid$ length if X is at most 2$\}$ and Σ={0, 1} is_____ (A) 7 (B) 6 (C) 8 (D) 5	1	2	1	2
3. Mealy and Moore machine can be categorized as_____ (A) Inducers (B) Transducers (C) Turing machines (D) Linearly bounder automata	1	1	1	1
4. A language for which no DFA exist is a_____ (A) Regular language (B) Non regular language (C) May be regular (D) Cannot be said	1	1	1	2
5. Pitch the limitation of finite automata is that_____ (A) It can't remember arbitrary large amount of information (B) It sometimes recognizes grammar that is not regular (C) It sometimes fails to recognize regular grammar (D) It has to say what happens for each input symbols in every state	1	2	1	2
6. Push down automata accepts which language? (A) Context sensitive language (B) Context free language (C) Recursive language (D) Regular language	1	1	3	2
7. A context free grammar G is in Chomsky normal form if every production is of the form_____ (A) A→BC or A→A (B) A→BC or A→a (C) A→BCa or B→b (D) A→aAB	1	1	2	1

8. Which of the following statement is false? 1 2 2 2
   (A) A recursive language is also a regular language
   (B) A context language is also a regular language
   (C) A context free language is also recursive enumerable language
   (D) Both A and B

9. The context free grammar S→SS|0S1|1S0|ε generates_____ 1 2 3 2
   (A) Equal number of 0's and 1's
   (B) Unequal number of 0's and 1's
   (C) Any number of 0's followed by any number of 1's
   (D) One 0's followed by two 1's

10. Which of the following language over the alphabet {0, 1} is described by the regular expression (0+1)*0(0+1)*0(0+1)*? 1 2 2 2
   (A) String with substring 00
   (B) String contains at least two 0's
   (C) String with atmost two 0's
   (D) String with exactly two 0's

11. How does PDA differ from a finite state machine? 1 2 3 1
   (A) It refers the top of the stack to transition
   (B) Its transitions only based on the current state
   (C) It works same as finite state machine
   (D) Both are same working process

12. A DPDA is a PDA in which _____ 1 2 3 1
   (A) Atleast one state has more than one transitions
   (B) More than one state can have two or more outgoing transitions
   (C) No state P has two outgoing transitions
   (D) Three state can have outgoing transitions

13. A PDA machine configuration (ρ, ω, y) can be appropriately represented as_____ 1 2 3 2
   (A) (current state, unconsumed input, stack content)
   (B) (input, state, stack content)
   (C) (unconsumed input, current state, stack content)
   (D) (current state, stack content, unconsumed input)

14. Which one of the following language over {a,b,c} is accepted by deterministic push down automata? 1 2 3 2
   (A) $\{WCW^R \mid W \in \{a,b\}^*\}$
   (B) $\{WW^R \mid W \in \{a,b,c\}^*\}$
   (C) $\{a^n b^n c^n \mid n >= 0\}$
   (D) $\{W \mid W \text{ is a palindrome over } \{a,b,c\}\}$

15. A push down automata can represented using_____ 1 1 3 1
   (A) Algorithm
   (B) Transition table
   (C) Code
   (D) Flow chart

16. According to Chomsky hierarchy which of the following is adopted recursively enumerable language? 1 1 3 2
   (A) Type 0
   (B) Type 1
   (C) Type 2
   (D) Type 3

17. An Instaneous description of turing machine consists of_____ 1 1 4 1
   (A) Present state and input to be processed
   (B) Present state and entire input to be processed
   (C) Present input only
   (D) Previous state and input to be processed

18. A multi tape turing machine is _____powerful than a single tape turing machine. 1 1 4 2
   (A) Less
   (B) Equal
   (C) More
   (D) No comparison

19. Which of the following isn't right regarding potential results while executing a TM for a given_____ 1 1 5 2
   (A) It may help to halt and accept the input
   (B) It may halt by changing the input
   (C) It may halt and reject the input
   (D) It may never halt

20. The estimation of N if TM is characterized utilizing n-tuples? 1 2 5 2
   (A) 5
   (B) 6
   (C) 7
   (D) 8

21. If P≠NP the statement which holds true is_____ 1 1 6 4
   (A) NP-hard=NP
   (B) NP-complete ∩P=ϕ
   (C) P=NP-complete
   (D) NP-complete=NP

22. Which of the following problems is not NP-hard? 1 1 6 4
   (A) Hamiltonian circuit problem
   (B) The 0/1 knapsack problem
   (C) Finding B1-connected component of a graph
   (D) The graph coloring

23. PCP stands for_____ 1 1 5 1
   (A) Pre corresponding problem
   (B) Post corresponding problem
   (C) Post correspondence problem
   (D) Pre corresponding problem

24. The hardest of NP problems can be_____ 1 1 5 1
   (A) NP-complete
   (B) P
   (C) NP-hard
   (D) Decidable

25. A problem is called _____if its has an efficient algorithm for itself. 1 1 6 2
   (A) Untraceable
   (B) Computational
   (C) Non computational
   (D) Traceable

PART – B (5 × 10 = 50 Marks)

Answer **ALL** Questions

		Marks	BL	CO	PO
26. a.	Construct a minimized DFA equivalent to the regular expression (0+1)01.	10	4	1	2

(OR)