15528

Reg. No.

V Semester B.C.A. Degree Examination, March/April - 2023

COMPUTER APPLICATIONS

Theory of Computation

(CBCS Scheme 2019-20)

Time : 3 Hours **Maximum Marks :100**

Instructions to Candidates:

Answer all Sections.

SECTION-A

Answer any TEN questions. Each question carries 2 marks. **(10×2=20)**

1. Define DFA with mathematical representation .
2. Define transition table. Give an example.
3. What is trap state? Give an example.
4. Define Regular Expression.
5. State Arden's theorem.
6. Define Grammar. Give an example.
7. Define Push Down Automata.
8. What is Parsing (Derivation) and its types.
9. Define CNF.
10. Define Left - recursion.
11. Define Turing machine.
12. Define Post correspondence problem.

P.T.O

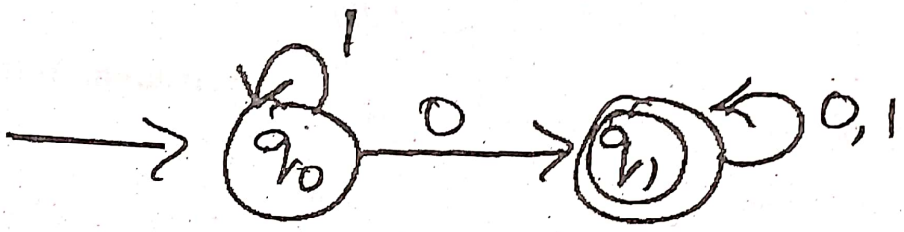
SECTION - B

Answer any FIVE questions. Each question carries 5 marks. (5×5=25)

13. Differentiate between DFA, NFA and ∈-NFA.

14. Construct a DFA to accept the strings of a's and b's not ending with the substring abb.

15. Obtain a regular expression for the finite Automata shown below (using Kleene's theorem).



16. Prove the given Language is not a regular. $L = \{ww^R / w \in (a+b)^*\}$.

17. Obtain the Left most derivation and right most derivation for the string 00112. The production rules are given by

$$
\begin{aligned}
P = \{ & \\
& S \rightarrow AB \\
& A \rightarrow 01 \mid 0A1 \\
& B \rightarrow \in \mid 2B \\
\} &
\end{aligned}
$$

18. Write a note on Chomsky hierarchy.

19. Show that the given grammar is ambiguous.

E → E+E

E → E-E

E → E*E

E → E/E

E → (E)

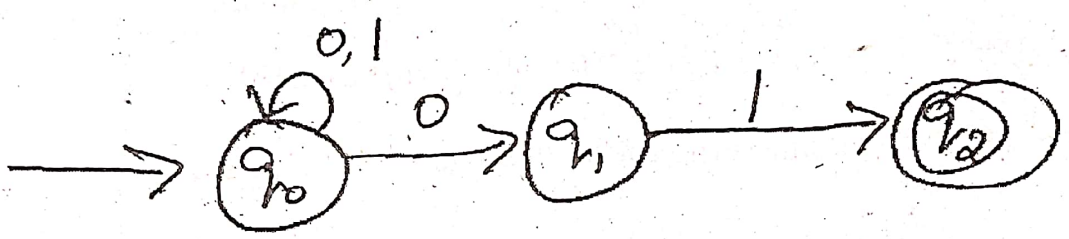
E → id

20. Explain types of Turing machine.

SECTION - C

Answer any THREE questions. Each question carries 15 marks. (3×15=45)

21. Convert the following NFA to its equivalent DFA.



22. Minimize the following DFA.

	δ	0	1
→	A	B	D
	B	C	E
	C	B	E
	D	C	E
*	E	E	E

23. Obtain the PDA to accept the language $L = \{a^n\ b^n \mid n \geq 1\}$.

24. Consider the following grammar.

S → 0A/1B

A → 0AA/1S/1

B → 1BB/0S/0

Obtain the grammar in CNF. (10)

25. a) Eliminate the unit productions from the given grammar

S → A 0/B

B → A/11

A → 0/12/B (5)

b) Explain the various applications of Regular expression.

SECTION - D

Answer any ONE question. Each question carries 10 marks. (1×10=10)

26. Construct a $\in$-NFA for the regular expression (a+b)* aa (a+b)*

27. Obtain the Turing machine to accept the language $L = \{0^n\ 1^n \mid n \geq 1\}$

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Reg. No. | | | | | | | | | |

V Semester B.C.A. Degree Examination, April - 2022

COMPUTER SCIENCE

Theory of Computation

(CBCS Scheme)

Time : 3 Hours **Maximum Marks : 100**

Instructions to Candidates:

Answer all sections.

SECTION - A

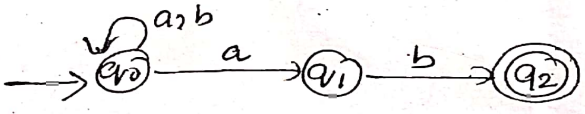
Answer any 10 questions. Each question carries 2 marks. **(10×2=20)**

1. What is Finite Automata? Mention its types.
2. Define trap state?
3. State any two differences between DFA and NFA.
4. Draw a DFA to accept strings of a's & b's having atleast one a.
5. State Arden's Theorem.
6. Obtain a regular expression representing strings of a's and b's having length 2.
7. State pumping lemma for regular languages.
8. Define grammar in finite Automata.
9. Define LMD and RMD.
10. Define CNF.
11. List the properties of Regular languages.
12. Define Post correspondence problem.

SECTION - B

Answer any **five** questions. Each question carries **five** marks. **(5×5=25)**

13. Mention five differences between DFA, NFA ε - NFA.
14. Construct a DFA to accept the strings of a's and b's ending with the string abb.
15. Explain various applications of finite Automata.
16. Obtain the DFA for the following NFA using Lazy Evaluation method.



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17. Obtain an ε-NFA which accepts strings of a's and b's starting with the string ab.

18. Explain Chomsky's Hierarchy.

19. Is the following grammar ambiguous?

$E \rightarrow E + E$

$E \rightarrow {}^{*}E + E$

$E \rightarrow E * E$

$E \rightarrow E / E$

$E \rightarrow (E) / I$

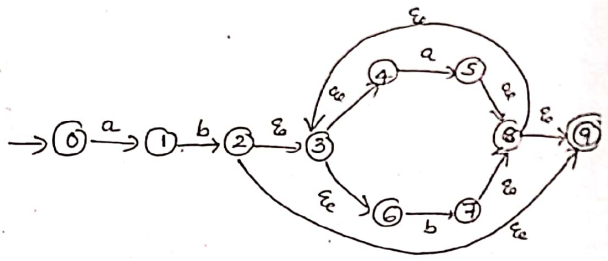
$I \rightarrow id$

20. Explain Haltinig problem of Turing machine.

SECTION - C

Answer any **three** questions. Each question carries 15 marks. **(3×15=45)**

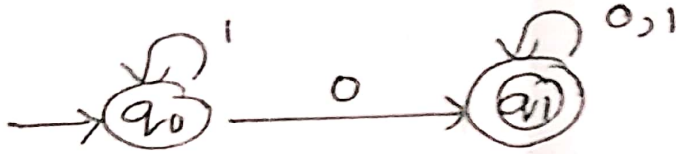
21. Convert the following ε-NFA to its equivalent DFA.



22. Minimize the states of the following DFA

	S	a	b
→	A	B	F
	B	G	C
*	C	A	C
	D	C	G
	E	H	F
	F	C	G
	G	G	E
	H	G	C

23. Obtain Regular expression for the following DFA.



24. Convert the given CFG to CNF

$S \rightarrow OA \mid 1B$
$A \rightarrow OAA \mid 1S \mid 1$
$B \rightarrow 1BB \mid OS \mid 0$

25. Obtain PDA to accept the language $L = \{a^n b^n \mid n \geq 1\}$ by a final state.

SECTION - D

Answer any **one** question. Each question carries **ten** marks. **(1×10=10)**

26. "Draw a DFA to accept decimal strings divisible by 3" using divisible by k method.

27. Obtain the Turing Machine to accept the language $L = \{0^n 1^n \mid n \geq 1\}$.
