



CB – 480

VI Semester B.C.A. Examination, August/September 2023

(CBCS) (F+R) (2016-17 and Onwards)

COMPUTER SCIENCE

BCA 601 : Theory of Computation

Time : 3 Hours

Max. Marks : 100

Instruction : Answer *all* Sections.

SECTION – A

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

1. Define finite automata and write the tuple.
2. Define E-closure of a state.
3. What is trap state ?
4. Define a R.E. for the language containing 0's and 1's ending with 001.
5. Mention the different types of grammar.
6. State Arden's theorem.
7. What is parsing ? Name two types of parsing.
8. Define GNF.
9. State Post Correspondence Problem (PCP) of turing machine.
10. Define nullabe variable.
11. What is left recursion ?
12. Name different types of turing machine.

P.T.O.



SECTION – B

Answer **any five** questions. **Each** question carries **5** marks.

(5×5=25)

13. Design a DFA that accepts strings of a's and b's ending with ab.

14. Check the given grammar is ambiguous.

$$S \rightarrow 0S1S|1S0S|\epsilon$$

15. Design a ϵ -NFA for the regular expression $(00^* + 1)$.

16. Differentiate among DFA, NFA, ϵ -NFA.

17. Reduce the grammar into CNF

$$S \rightarrow aAD$$

$$A \rightarrow aB|bAB$$

$$B \rightarrow b$$

$$D \rightarrow d$$

18. Explain Chomsky Hierarchy of grammars.

19. Write down the left most, right most derivation of the given grammar for the string abbbb using the productions.

$$S \rightarrow aAB$$

$$A \rightarrow bBb$$

$$B \rightarrow A|\epsilon.$$

20. Construct the PDA to accept the language $L(M) = \{w \in (a+b)^* \mid w \in w^R\}$ where w^R is reverse of w .



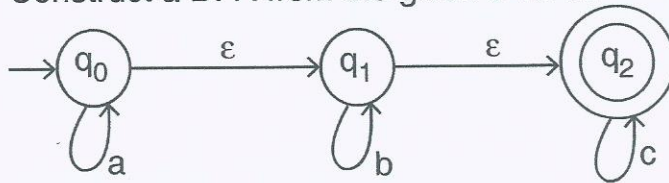
SECTION – C

Answer **any three** questions. **Each** question carries **15** marks.

(3×15=45)

21. Construct a DFA from the given ϵ -NFA.

15



22. Minimize the DFA.

15

δ	a	b
A	B	E
B	C	F
* C	D	H
D	E	H
E	F	I
* F	G	B
G	H	B
H	I	C
* I	A	E

23. a) Eliminate useless symbols from the given grammar.

7

$S \rightarrow A11B \mid 11A$

$S \rightarrow AB \mid 11$

$A \rightarrow 0$

$B \rightarrow BB$

b) Eliminate unit productions.

8

$S \rightarrow AB$

$A \rightarrow a$

$B \rightarrow C$

$B \rightarrow b$

$C \rightarrow D$

$D \rightarrow E$

$E \rightarrow a$



24. Construct a TM to accept the language.

15

$$L(M) = \{0^n 1^n \mid n \geq 1\}$$

25. Convert the given CFG to GNF.

15

$$S \rightarrow AB$$

$$A \rightarrow BSB$$

$$A \rightarrow a$$

$$B \rightarrow b$$

SECTION – D

Answer **any one**. Each carries **10** marks.

(1×10=10)

26. Construct a DFA which accepts even number of a's and even number of b's.

27. Using pumping Lemma prove that the language $L = \{a^n b^n \mid n \geq 0\}$ is not regular.
