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.

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.

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

15. Design a $\in$–NFA for the regular expression $(00^* + 1)$.

16. Differentiate among DFA, NFA, $\in$– 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.

    $S \rightarrow aAB$

    $A \rightarrow bBb$

    $B \rightarrow A|\varepsilon.$

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

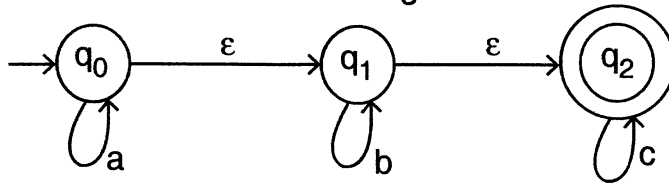## SECTION – C

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**

    $S \to A11B \mid 11A$

    $S \to AB \mid 11$

    $A \to 0$

    $B \to BB$

   b) Eliminate unit productions.   **8**

    $S \to AB$

    $A \to a$

    $B \to C$

    $B \to b$

    $C \to D$

    $D \to E$

    $E \to a$

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.

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