

D3BCA1803 (S4)

(PAGES...)

Reg. No.....

Name: .....

**SECOND SEMESTER BCA DEGREE EXAMINATION, NOVEMBER 2023**

BCA

**CBCA3C06T-THEORY OF COMPUTATION**

**Time: 3 hours**

**Maximum Marks: 80**

**Answer all questions. Each carries 1 mark**

1. What is a binary relation?
2. Define the term graph. List any two applications of graphs.
3. What is DFA?
4. What is a Transition Diagram?
5. Write a note on Type-1 grammar
6. Define the term regular expression
7. What are alphabets?
8. List the features of context-free grammar.
9. Write a note on Turing machine.
10. What is Deterministic PDA?

**(10 x 1=10 Marks)**

**Answer all questions. Each carries 2 marks**

11. Explain any two applications of the graph.
12. What are the properties of subsets?
13. Obtain the grammar for the following language  
 $L = \{a^{n+1} b^n \mid n \geq 0\}$
14. Eliminate the null production in the grammar  
 $S \rightarrow aA$   
 $A \rightarrow BB$   
 $B \rightarrow aBb / \epsilon$
15. What are the applications of automata theory?
16. What is a Mealy machine?
17. What are the different types of pushdown automata?
18. Construct a Turing machine for the language  $L = \{0^{2n} 1^n \mid n \geq 0\}$

**(8x2=16 Marks)**

**Answer any 6 questions. Each carries 4 marks**

19. Explain proof by induction method by a suitable example.
20. What are the properties of functions.
21. Explain Linear Bounded Automata.
22. Define the Regular set and explain its Closure Properties.
23. Convert the following CFG into CNF

$S \rightarrow ASA \mid aB, A \rightarrow B \mid S, B \rightarrow b \mid \epsilon$

24. What is ambiguity in context-free grammars give an example.
25. Show that the set of those words  $w$  over the alphabet  $\{a,b\}$  which have the same number of  $a$ 's and  $b$ 's is not a linear context-free language.
26. Obtain PDA for the language  $L = \{0^n 1^n \mid n \geq 1\}$
27. State Pumping Lemma for the Regular Languages and Prove that  $L = \{a^n b^{2n}, n > 0\}$  is not regular.

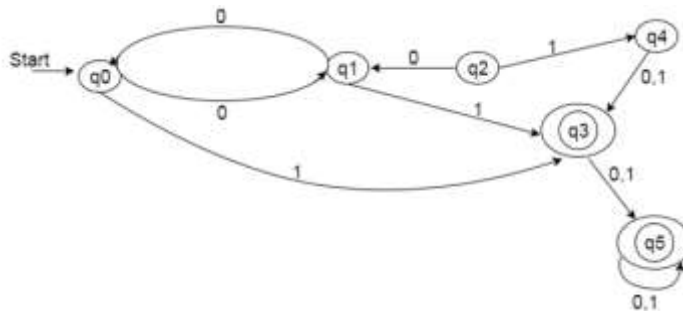
(6x4=24 Marks)

(PTO)

(Page No.2)

Answer any 3 questions. Each carries 10 marks

28. Explain different types of relations with suitable examples.
29. Minimize the DFA



30. Write a detailed note on Chomsky classification of languages
31. Find a reduced grammar equivalent to the grammar  $G$ , having production rules,  
 $P: S \rightarrow AC \mid B, A \rightarrow a, C \rightarrow c \mid BC, E \rightarrow aA \mid e$
32. Describe the Turing Machine that accepts the language  $L = \{a^n b^n, n > 0\}$ . Also derive the computational sequence for the input sequence  $w = aaabbb$ .

(3x10=30 Marks)