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Name.....

Reg. No.....

**THIRD SEMESTER (CBCSS-UG) DEGREE EXAMINATION
NOVEMBER 2021**

B.C.A.

BCA 3C 06—THEORY OF COMPUTATION

(2019—2020 Admissions)

Time : Two Hours

Maximum : 60 Marks

Section A*Answer atleast **eight** questions.**Each question carries 3 marks.**All questions can be attended.**Overall ceiling 24.*

1. What is Set and explain various ways of describing a set ?
2. What is a mealy machine ?
3. Explain relations. What are its properties ?
4. Define one-to-one function with example.
5. Define Grammar.
6. Explain parse tree in detail.
7. Define top down parsing.
8. Define Pushdown automata.
9. If $n \geq 1$, show that $1.1! + 2.2! + \dots + n.n! = (n + 1)! - 1$.
10. What are the identities for regular expression ?
11. What is a transition system ?
12. Show that $f : \mathbb{R} \rightarrow \mathbb{R} - \{1\}$ given by $f(x) = (x + 1)/(x - 1)$ is onto.

(8 × 3 = 24 marks)

Section B*Answer atleast **five** questions.**Each question carries 5 marks.**All questions can be attended.**Overall ceiling 25.*

13. Show that a connected graph G with n vertices and $n - 1$ edges ($n \geq 3$) has at least one leaf.
14. Explain Chomsky classification of languages.

Turn over

15. Explain tree and its properties.
16. Explain ambiguous grammars. If G is the grammar $S \rightarrow SbS \mid a$, check G is ambiguous or not.
17. Explain Normal Forms for Context free Grammars.
18. Prove the theorem by induction : A tree with n vertices has $(n - 1)$ edges.
19. Define Turing Machine.

(5 × 5 = 25 marks)

Section C

*Answer any **one** question.*

Each question carries 11 marks.

20. Prove that the theorem, if L is then there set accepted by NDFAs, then there exists a DFA which also accepts L .
21. Define Chomsky normal form. Find a grammar in CNF equivalent to :

$S \rightarrow aAD, A \rightarrow aB \mid bAB, B \rightarrow b, D \rightarrow d.$

(1 × 11 = 11 marks)