SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
B.Sc. Maths - END SEMESTER EXAMINATIONS APRIL - 2024
SEMESTER - VI
14UMACE6A02 - Formal Languages and Automata Theory

Total Duration : 2 Hrs. 30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. Define context sensitive grammar. Find a context sensitive grammar to generate the language $L(G) = \{a^n b^n c^n / n \geq 1\}$.
2. Show that the grammar $G = (N, T, P, S)$ where $N = \{S\}$, $T = \{a, b\}$ and $P : S \to aSb, S \to ab$ generates the language $L = \{a^n b^n, n \geq 1\}$.
3. Prove that the family of phrase structure languages is closed under reflection.
4. Show that the catenation of two regular languages is also regular.
5. Find the Chomsky normal form of the grammar $G = (N, T, P, S)$ where $N = \{S\}$, $T = \{a, b\}$ and $P : S \to aSb, S \to ab$.
6. What is a finite state automaton? Distinguish between deterministic and non deterministic finite state automata.
7. Construct a deterministic finite state automaton for the language $L = \{a^n b^n, n \geq 1\}$
8. Determine whether the language $L = \{a^n b^n, n \geq 1\}$ is regular using pumping lemma.

Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. Let $L = \left\{w / w \in \{a, b\}^+\right\}$ and *w* consists of equal number of *a*'s and *b*'s. Describe a context free grammar generating L and prove that L(G) = L by induction.
10. Prove that the family of context free languages is closed under union but not closed under intersection.
11. State and prove the Chomsky normal form theorem.
12. Prove the equivalence of deterministic and nondeterministic finite state automata.
13. State and prove the pumping lemma for regular languages.

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