

(6 Pages)

Reg. No. :

Code No. : 6323

Sub. Code : PMAE 33

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2021

Third Semester

Mathematics

Elective — FORMAL LANGUAGES AND AUTOMATA
THEORY

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answers :

1. The language is a ————— if it is the set accepted by some finite automation.
 - (a) Regular set
 - (b) Just regular
 - (c) (a) and (b)
 - (d) Language accepted

2. The language accepted by _____
(a) DFA (b) NFA
(c) (a) and (b) (d) Not DFA
3. The regular sets are closed _____
(a) Union (b) Concatenation
(c) Kleene closure (d) All
4. Every finite automation induces a _____ invariant equivalence relation.
(a) Right invariant (b) Left invariant
(c) Index (d) Invariant
5. A context-free grammar is a finite set of _____ each of which represents a language.
(a) Syntactic categories
(b) Non terminals
(c) Terminals
(d) All
6. A string of _____, α is called a sentential form if $S^* \Rightarrow \alpha$
(a) Terminals (b) Variables
(c) (a) and (b) (d) Equivalent

7. Push down automation will have an _____
(a) Input tape (b) Finite control
(c) Stack (d) All
8. The push down automation is essentially a finite automaton with control of _____
(a) Input tape (b) Stack
(c) First in first out (d) All
9. The context free language are not closed under _____
(a) Intersection (b) Complementation
(c) (a) and (b) (d) Homomorphism
10. If L is a CFL is _____ under intersection with a regular set.
(a) Closed (b) Not closed
(c) Union (d) All

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Explain regular expressions with an example.

Or

- (b) Explain finite automata with ε -moves.

12. (a) Prove that the class of regular set is closed under substitution.

Or

- (b) Write the algorithm for marking pairs of in equivalent states.

13. (a) Define derivation tree with an example.

Or

- (b) Write the Greibach normal – form algorithm.

14. (a) If L is a context-free language then prove that there exist a PDA M such that $L = M(N)$.

Or

- (b) Explain accepted languages.

15. (a) Prove that the CFL's are not closed under intersection.

Or

- (b) State and prove Ogden's lemma.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) If L is accepted by an NFA with ε -transitions then prove that L is accepted by an NFA without ε -transitions.

Or

- (b) If L is accepted by a DFA then prove that L is denoted by a regular expression.

17. (a) State and prove pumping lemma for regular set.

Or

- (b) State and prove Myhill-Nerode theorem.

18. (a) Let $G = (V, T, P, S)$ be a context-free grammar. Then prove that $S^* \Rightarrow \alpha$ iff there is a derivation tree in grammar G with yield α .

Or

- (b) Given a GFG $G = (V, T, P, S)$ with $L(G) \neq \Phi$ find an equivalent CFG $G' = (V', T, P', S)$ such that for each A in V' there is some w in T^* for which $A^* \Rightarrow w$.

19. (a) Let L is $N(M)$ for some PDA M then prove that L is a context – free language.

Or

- (b) Explain push down automation with an example.

20. (a) State and prove pumping lemma for context-free language.

Or

- (b) Prove that the context free languages are closed under inverse homomorphism.
