

[25104]

SPECIAL DRIVE - DEC - 2022
M.C.A. DEGREE EXAMINATIONS
SECOND SEMESTER

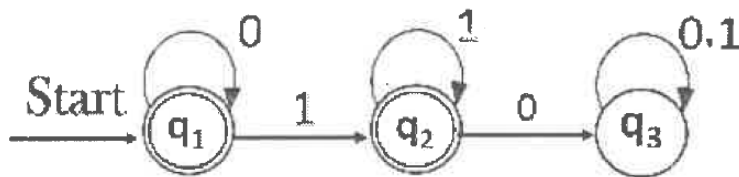
Paper - IV : FORMAL LANGUAGES AND AUTOMATA THEORY
(2016-17 and 2017-18 Admitted Batches)

Time : 3 Hours**Maximum Marks: 75****SECTION - A****Answer ALL questions.****(4×15=60)**

1. a) Prove that “L be the language accepted by NFA then there exists that accepts DFA”.
- b) Give the NFA's, which accepting the following languages over the alphabets {0, 1}
- Set of all strings with three consecutive 0's.
 - Set of all strings such that 5th symbol from right end is 1.

(OR)

- c) Find the regular expression for the following FSM:



- d) State and prove Pumping Lemma for the regular language.

2. a) Eliminate ϵ – productions from the following CFG

$$S \rightarrow ABcC, A \rightarrow BC, B \rightarrow b | \epsilon, C \rightarrow D | \epsilon, D \rightarrow d$$

- b) Design a PDA for accepting a language $\{0^n 1^m 0^n \mid m, n \geq 1\}$.

(OR)

- c) Consider the grammar $S \rightarrow (L) \mid a, L \rightarrow L, S \mid S$. Derive expression $((a, a), (a, a))$ by leftmost derivation and rightmost derivation.
- d) Describe the closure properties of CFL.

3. a) What is mathematical description of Turing Machine? Design Turing machine for the language $L = \{a^n b^n c^n \mid n \geq 1\}$.

(OR)

- b) Show that the Post Correspondence problem with the two lists $x = (b, bab^3, ba)$ and $y = (b^3, ba, a)$ has solution.
- c) Show that “Post Correspondence Problem is un-decidable”.

4. a) Show that $R \rightarrow S$ can be derived from the premises $P \rightarrow (Q \rightarrow S)$, $\neg R \vee P$ and Q .
- b) Describe the syntax of predicate calculus.

(OR)

- c) Illustrate Unification theorem in predicate logic.
- d) Prove that the conditional statement $[(P \rightarrow Q) \wedge (Q \rightarrow R)] \rightarrow (P \rightarrow R)$ is Tautology using logical equivalencies.

SECTION - B

Answer any FIVE questions.

(5×3=15)

5. a) Give the grammar for the language: $L = \{a^n + 1 b^n \mid n \geq 0\}$.
- b) Define Linear Bounded Automata.
- c) Differentiate Moore and Mealy machine.
- d) Define homomorphism and inverse homomorphism.
- e) Give the regular expression for language $L = \{a^m b^n \mid m \geq 2, n \leq 3\}$.
- f) Write about Parsing.
- g) What is Universal Turing Machine?
- h) What is NP – completeness? Give an example.
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