- 11. Construct a Turing Machine that will accept the language consists of all palindromes of 0's and 1's.
- 12. Define context free grammar. State and explain the closure properties of CFG.
- $13. S \rightarrow aABB \mid aAA, A \rightarrow aBB \mid a, B \rightarrow bBB \mid A,$ construct the PDA that accepts the language generated by given grammar.

MCA-302

December – Examination 2023 MCA (IIIrd Year) Examination FORMAL LANGUAGE AND AUTOMATA

Paper: MCA-302

Time: 3 Hours] [Maximum Marks: 80

Note: The question paper is divided into three Sections A, B and C. Write answers as per the given instructions.

Section–A $8\times2=16$

(Very Short Answer Type Questions)

- Note: Answer all questions. As per the nature of the question delimit your answer in one word, one sentence or maximum up to 30 words. Each question carries 2 marks.
- . (i) Does push down automata have memory?

 Give explanation.
 - (ii) List the components of a Turing Machine.

MCA-302/4 (1) $\underline{TC-72}$ Turn Over

 $\underline{TC-72}$

MCA-302/4 (4)

- (iii) Define unit production.
- (iv) What is the significance of e-Moves?
- (v) What is Graph? Give one example.
- (vi) What are Universal Turing Machines?
- (vii) Give an example of undecidable problem.
- (viii) What is Turing machine halting problem?

Section-B

 $4 \times 8 = 32$

(Short Answer Type Questions)

Note: Answer any four questions. Each answer should not exceed 200 words. Each question carries 8 marks.

- 2. What do you mean by natural language processing? How NLP is related to formal language and automation? Discuss in detail.
- 3. Define Finite Automation. Explain about the model of Finite Automation.
- 4. If set $A = \{1, 2, 3\}$ and relation defined on A as :
 - $R1 = \{(1, 1)(2, 2)(3, 3), (1, 2)(1, 3)(2, 3)\}$
 - (ii) $R2 = \{(1, 1)(2, 2)(3, 3)\}$
 - (iii) $R3 = \{(1, 1)(2, 3)(3, 1), (3, 2)(1, 3)(3, 3)\}$

(2)

(iv) $R4 = \{(1, 3)(3, 1)(2, 3)(3, 2)\}$

TC-72

Check whether the following relations are:

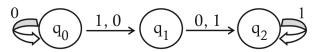
- Reflexive
- Symmetric
- Transitive
- 5. Explain the pumping lemma for regular sets. Show that $L = \{a^p \mid p \text{ is a prime}\}\$ is not regular.
- 6. Discuss in brief about NP Hard problems.
- 7. Distinguish between Mealy and Moore machine.
- 8. Explain the procedure for constructing minimum state DFA with an example.
- 9. Discuss in brief about NP Hard Problems.

Section-C

 $2 \times 16 = 32$

(Long Answer Type Questions)

- Note: Answer any two questions. You have to delimit your each answer maximum up to 500 words. Each question carries 16 marks.
- 10. Convert the following NFA to equivalent DFA (q₀ is the starting state and q_2 is final state):



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(3)

Turn Over

MCA-302/4