# THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (2nd Cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4-point scale

## Backlog Arrear Examination, March 2021

**PGM 5426/5454/5416** **TIME:3HRS**

**AUTOMATA THEORY** **MARK:75**

**Answer Any FIVE questions**

1. Write a note on parsing.

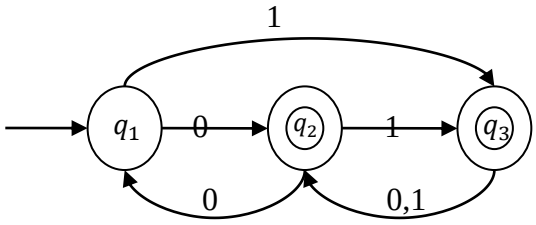
2. Design grammars for the following sets:
   $i)\ L_1 = \{a^n b^n c^n | n \geq 1\}$ $ii)\ L_2 = \{a^i \mid i\ is\ a\ positive\ power\ of\ 2\}$
   $iii)\ L_3 = \{\ W \in (a,b)^* \mid |w|_a = |w|_b\ \}$ $iii)\ L_4 = \{a^n b^m\ | n, m \geq 1\}$

3. Find a Greibach normal-form grammar equivalent to the following CFG:
   $S \rightarrow AA|0, A \rightarrow SS|\ 1$.

4. **(a)**. Prove that any context free language without ϵ-transition is generated by a grammar in which all productions are of the form A→BC or A→a.
   **(b)**. Find the equivalent CNF of the grammar ({S,A,B},{a,b},P,S) that has the productions: S→bA|aB,A→bAA|aS|a,B→aBB|bS|b.

5. State and prove the pumping lemma for the regular sets, and hence deduce that the language $\{0^{i^2} \mid i \geq 1\}$ is not regular.

6. (a) If L is accepted by a DFA, then prove that L is denoted by a regular expression.
   (b) Find the regular expression for the following FA:




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