

QP Code : 3654

Duration : 3 hours

Total marks : 80

Note.(1) Question No. 1 is compulsory

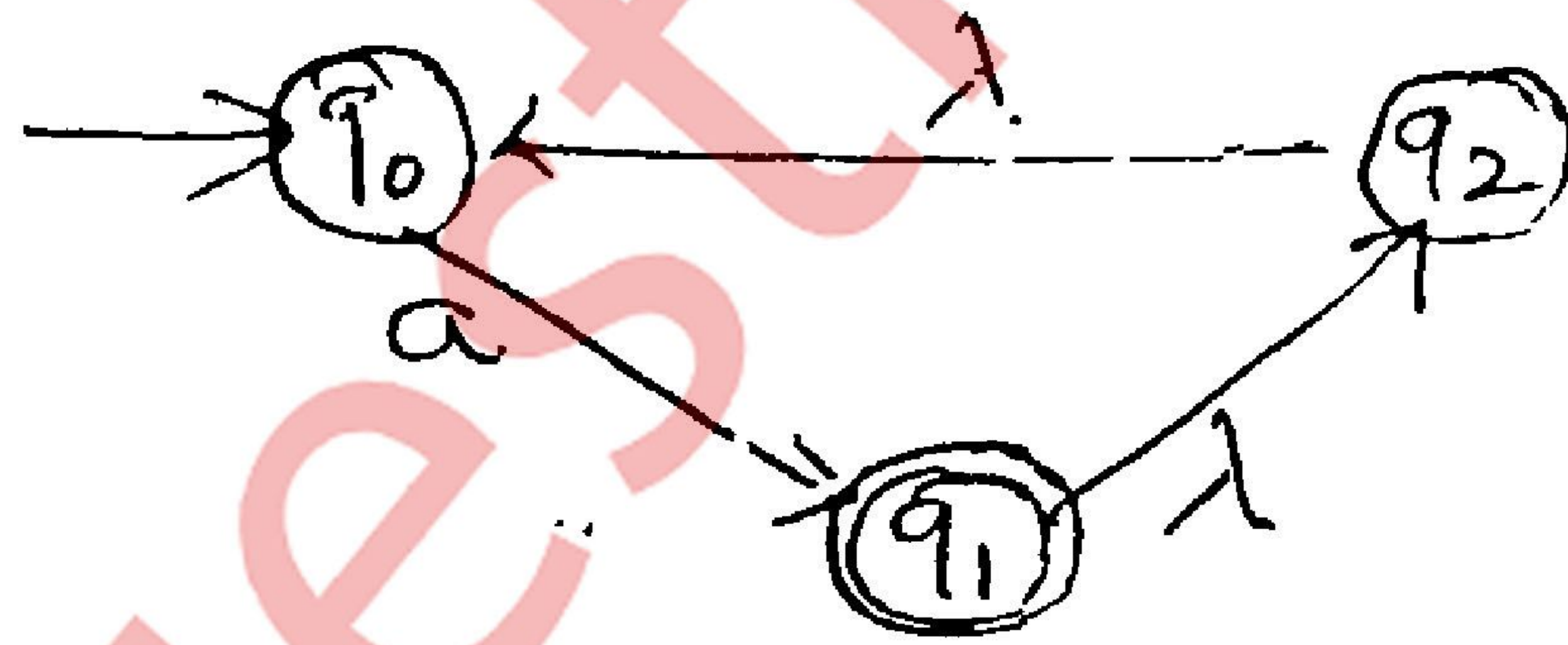
- (2) Attempt any three questions from remaining questions
- (3) Draw suitable diagrams wherever necessary
- (4) Assume suitable data, if necessary.

Q1. Attempt any four sub-questions.

- (a) Design a DFA to accept only those strings containing a substring 'aa'. (05)
- (b) Design a Moore machine for a binary adder. (05)
- (c) Give formal definition of a Push Down Automata. (05)
- (d) Construct a Context Free Grammar for the language with equal number of a's and b's. (05)
- (e) Give a regular expression for a language over the alphabet $\Sigma = \{a, b\}$ containing at most two a's. (05)

Q2. (a) Design a DFA that accepts the strings over a binary alphabet that do not contain the substring 010. (10)

(b) Convert the following NFA to a reduced DFA. (10)

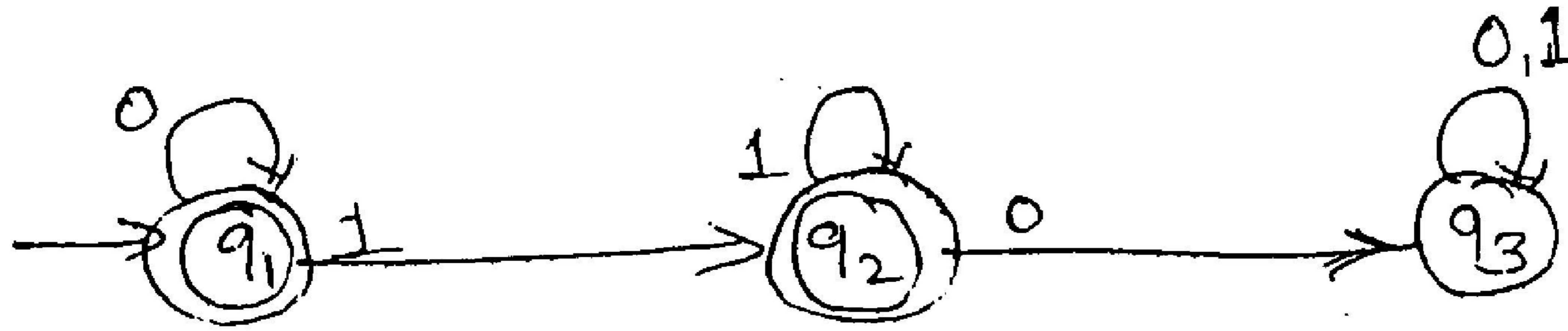


Q3. (a) What is a Mealy machine? Design a mealy machine to determine the residue mod 5 of a binary number. (10)

(b) Using pumping lemma prove that the following language is not regular (10)

$$L = \{ a^n b^n c^n \mid n \geq 0 \}$$

Q4. (a) Find a regular expression RE corresponding to the following FA (10)



(b) Design a Turing machine to recognize the language (10)

$$L = \{ 1^n 2^n 3^n \mid n \geq 1 \}$$

Q5 (a) What is a Greibach Normal Form (GNF). Convert the following CFG to GNF (10)

$$S \rightarrow Sab \mid Sba \mid \epsilon$$

(b) Design a PDA for the language $L = \{ ww^R \mid w \in \{ a, b \}^* \}$ (10)

Q6. Write short notes on (any two) (20)

- (a) Variants of Turing Machines
- (b) Recursive and Recursively enumerable languages
- (c) Chomsky Hierarchy
- (d) Halting Problem