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**TCS-402**

**B. TECH. CSE  
(FOURTH SEMESTER)  
MID SEMESTER**

**EXAMINATION, April, 2023  
FINITE AUTOMATA & FORMAL  
LANGUAGES**

**Time : 1½ Hours**

**Maximum Marks : 50**

**Note :** (i) Answer all the questions by choosing any *one* of the sub-questions.

(ii) Each question carries 10 marks.

1. (a) Construct a minimal DFA over input alphabet  $\Sigma = \{a, b\}$  such that accept all the string starting with 'ab' and  $|w| \bmod 4 = 3$ .

10 (CO1)

OR

- (b) Design a NFA for  $L = \{\text{all the string in which third symbol from RHS is 'a' and convert that NFA to the corresponding DFA.}$

10 (CO1)

*P. T. O.*

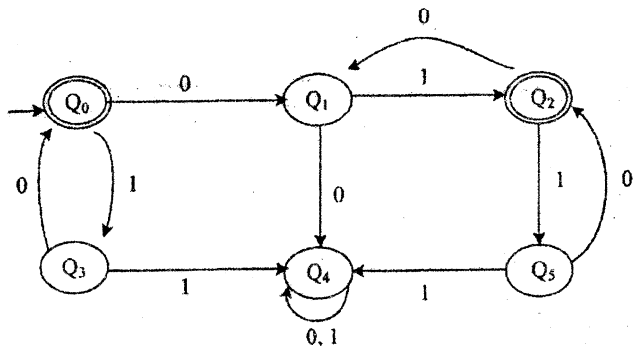
2. (a) Construct a minimal DFA that accept all the number of base 3, which when converted into decimal should be divided by 3. Given that  $\Sigma = \{0, 1, 2\}$ . 10 (CO1)

OR

- (b) Construct deterministic finite automata (DFAs) recognizing the following languages over the alphabet  $\{a, b\}$  :

$L = a^n b^m \mid n \geq 0, m \geq 0 \text{ and } n + m \text{ is an even number.}$  10 (CO1)

3. (a) Construct a minimum DFA equivalent to the DFA given in below figure : 10 (CO2)



(3)

TCS-402

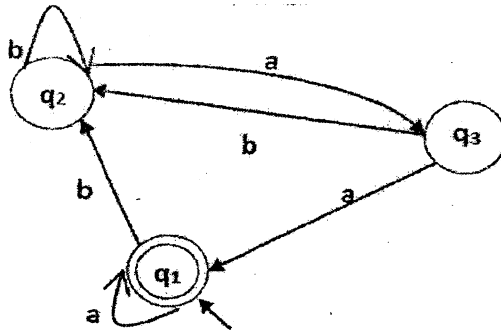
OR

- (b) Construct a DFA with reduced states equivalent to the regular expression.

$10 + (0 + 11) 0^*1$

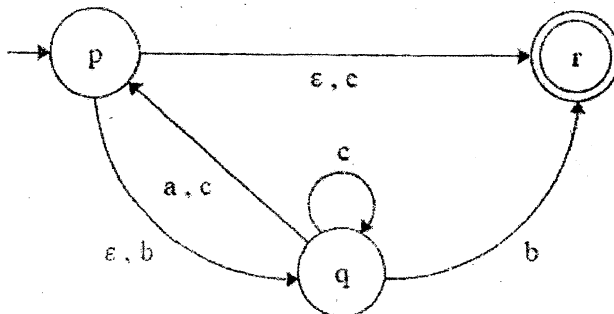
10 (CO2)

4. (a) Find the regular expression from the given automata using Arden's theorem. 10 (CO2)



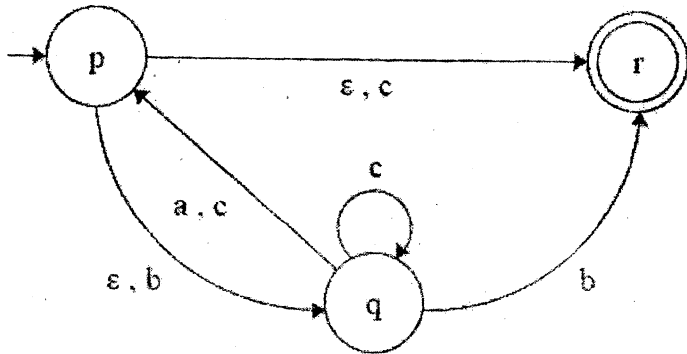
OR

- (b) Convert the following  $\epsilon$ -NFA to its equivalent NFA. 10 (CO2)



P. T. O.

5. (a) Construct a DFA equivalent to the NDFFA, whose state transition diagram is given below figure. 10 (CO2)



OR

- (b) Construct a Mealy machine which can output EVEN, ODD according as the total no. of 1's encountered is even or odd. The input symbols are 0 and 1. Convert this mealy machine to an equivalent Moore machine.