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K – 4290

Reg. No. :

Name :

Fourth Semester B.Tech. Degree Examination, September 2020

(2013 Scheme)

13.406 : FORMAL LANGUAGES AND AUTOMATA THEORY (R)

Time : 3 Hours

Max. Marks : 100

PART – A

Answer all questions. Each question carries 4 marks.

1. Design a DFA that accepts strings of binary numbers divisible by 3
2. Differentiate Mealy and Moore machine.
3. What is NPDA? Give an example.
4. Design a Turing machine to find 2's complement of a binary number.
5. Draw a NFA for $(a+b)^*ab$.

PART – B

Answer any one full question from each Module. Each full question carries 20 marks.

Module – I

6. (a) State and prove the equivalence of NFA with and without ϵ -transitions. 10
- (b) Design a Moore machine to determine residue mod 6 for each binary string which when interpreted as a non negative integer. Convert this Moore machine to Mealy machine. 10

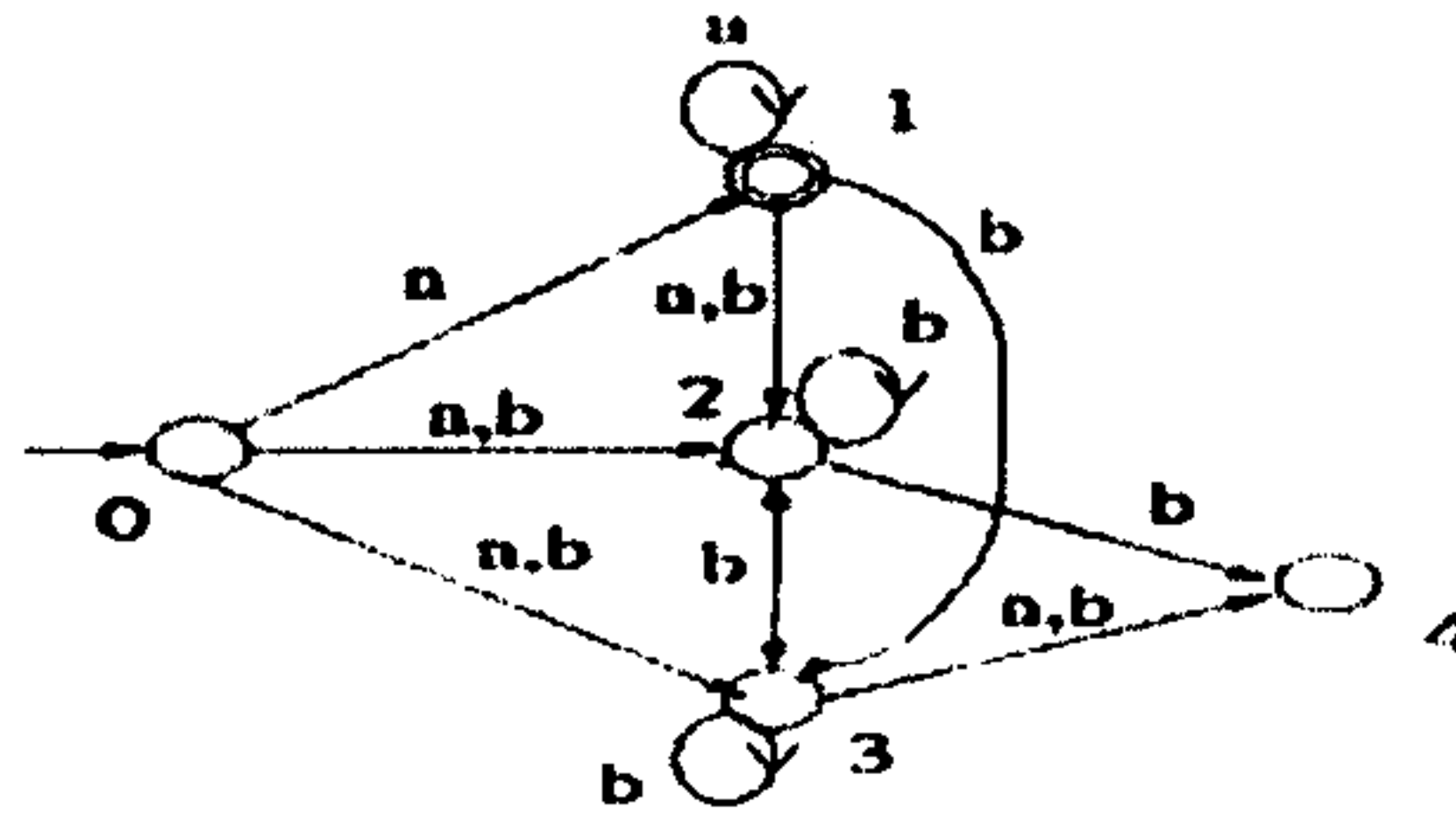
OR

P.T.O.



7. (a) Convert the following NFA to DFA.

10



(b) Construct a DFA to recognize decimal strings divisible by 3.

10

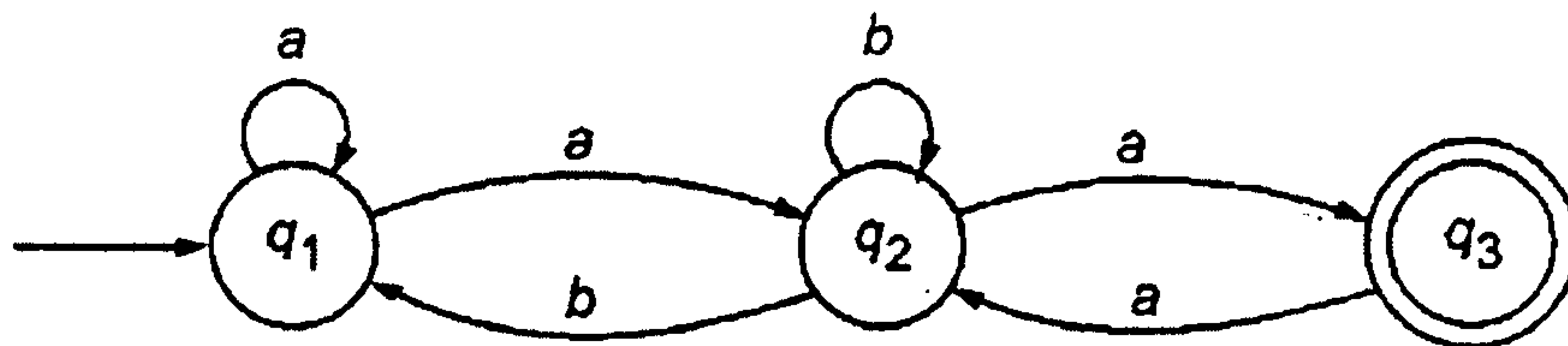
Module – II

8. (a) Prove that $L = \{ww^R / w \in \{0,1\}^* \text{ and } w^R \text{ is the reverse of } w\}$ is not regular.

10

(b) Convert to regular expression the FA given below.

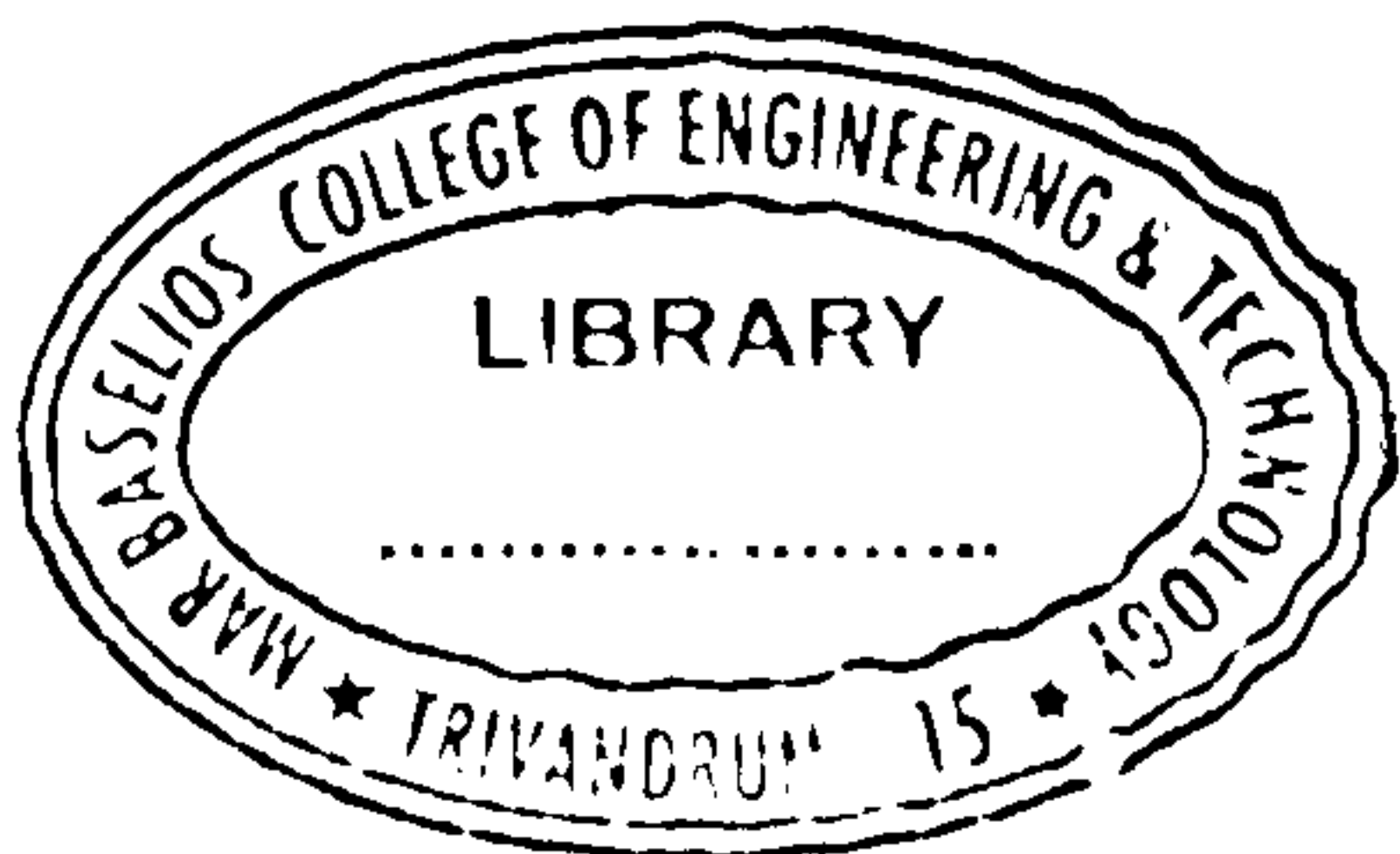
10



OR

9. (a) Minimize the automata given below.

10



States	0	1
→ q0	q1	q2
q1	q2	q3
q2	q2	q4
*q3	q3	q3
*q4	q4	q4
q5	q5	q4

(b) Describe decision algorithms for regular sets.

5

(c) List closure properties of regular sets.

5



Module – III

10. (a) Convert the grammar given below to CNF. 10

$$S \rightarrow \sim S / S \supset S / p / q$$

- (b) Describe Chomsky hierarchy. 10

OR

11. (a) Design a PDA accepting $L = \{a^n b^n \mid n \geq 0\}$ 10

- (b) Remove useless symbols of the CFG given by 5

$$S \rightarrow AB / CA, B \rightarrow BC / AB, A \rightarrow a, C \rightarrow aB / b.$$

- (c) Write the context free grammar to generate equal number of a's and b's. 5

Module – IV

12. Explain the different variants of Turing Machine in detail. 20

OR

13. (a) Design a Turing machine that accepts strings with equal number of 0's and 1's. 10

- (b) State and prove halting problem of Turing machines. 10

