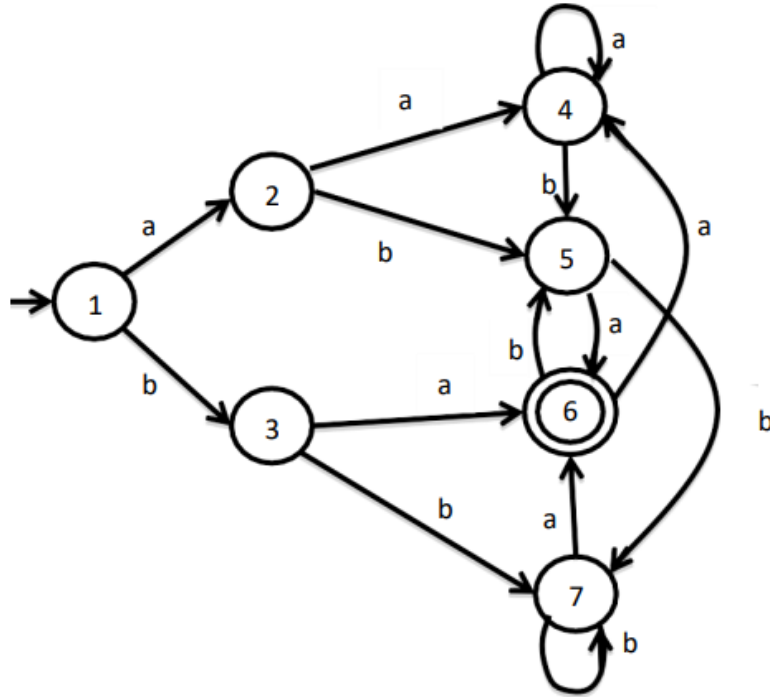


GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2023****Subject Code:3164203****Date:11-12-2023****Subject Name:Theory of Computation****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- Q.1** (a) Define the given functions: one-to-one, onto and bijection **03**
- (b) Write Regular Expressions corresponding to each of the following subsets of $\{0,1\}^*$ **04**
- (i) The language of all strings contains at least three 1.
 - (ii) The language of all strings contains No of 0 ('zero') in multiple of 3.
- (c) Write and explain the principle of mathematical induction using example. **07**
- Q.2** (a) Define DFA, NFA and NFA- Λ . **03**
- (b) Draw FA for string ending with 10 or 11. **04**
- (c) Prove Kleene's theorem part-1. **07**
- OR**
- (c) Minimize the DFA shown in Fig: **07**



- Q.3** (a) Discuss chomsky hierarchy. **03**
- (b) Define pumping lemma and its application. **04**
- (c) Design PDA for $L=\{x \in x^r / x \in \{a,b\}^*\}$. **07**
- OR**
- Q.3** (a) Define Context free grammar & context free language. **03**
- (b) Prove that the given grammar is ambiguous. **04**
- $A \rightarrow AA$

$A \rightarrow (A)$
 $A \rightarrow a$

- (c) Convert the following CFG to CNF : 07
 $S \rightarrow aX/Yb$
 $X \rightarrow S/\wedge$
 $Y \rightarrow bY/b$

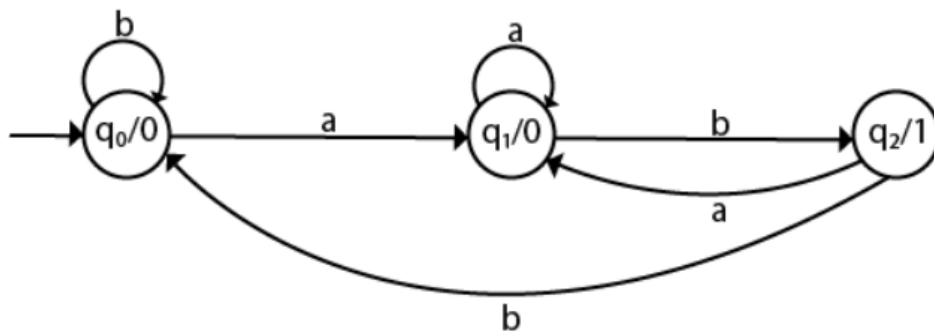
- Q.4** (a) Discuss - recursively enumerable languages. 03
 (b) Explain P class and NP class Problem. 04
 (c) Design a Turing machine to copy a string. 07

OR

- Q.4** (a) Give the difference between the moore machine and the mealy machine. 03
 (b) Describe the language generated by the following grammars: 04
 (i) $S \rightarrow aSb|\epsilon$
 (ii) $S \rightarrow aSa|bSb|a|b$

- (c) Explain primitive recursive function by a suitable example 07

- Q.5** (a) Enlist limitations of Turing machines. 03
 (b) Convert the given Moore machine into its equivalent Mealy machine. 04



- (c) What is decidability? How to prove that the given language is undecidable? List some undecidable problems. 07

OR

- Q.5** (a) Define Pushdown Automata. 03
 (b) Write a short note on church-turing thesis. 04
 (c) Convert following NFA- Λ to DFA. 07

