Total number of printed pages:02 **Programme(D)/6th/DCSE613**

2024

Formal Language and Automata Theory

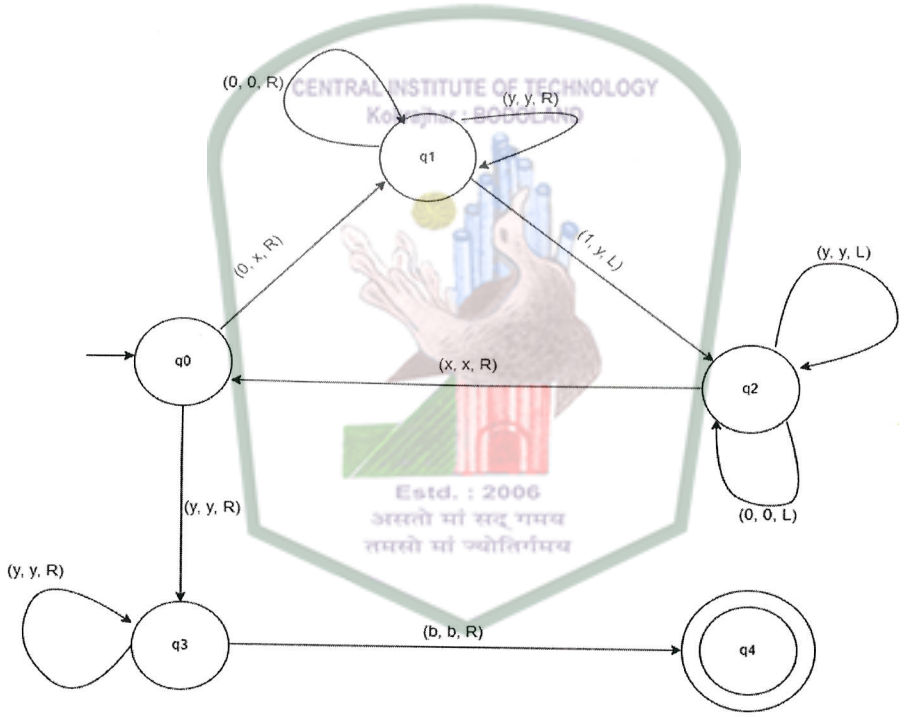
Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) 10



Process the string 0011 using the above Turing Machine.

b) Convert the following CFG to a PDA 10

S -> aSb | A, A -> bSa | S | ε .

Process the string aababb using the PDA.

2. a) Prove that the following grammar is ambiguous: 10

S -> S + S | S * S, S -> a | b

b) Reduce the following grammar to GNF: 10

S -> SS, S -> 0S1 | 01

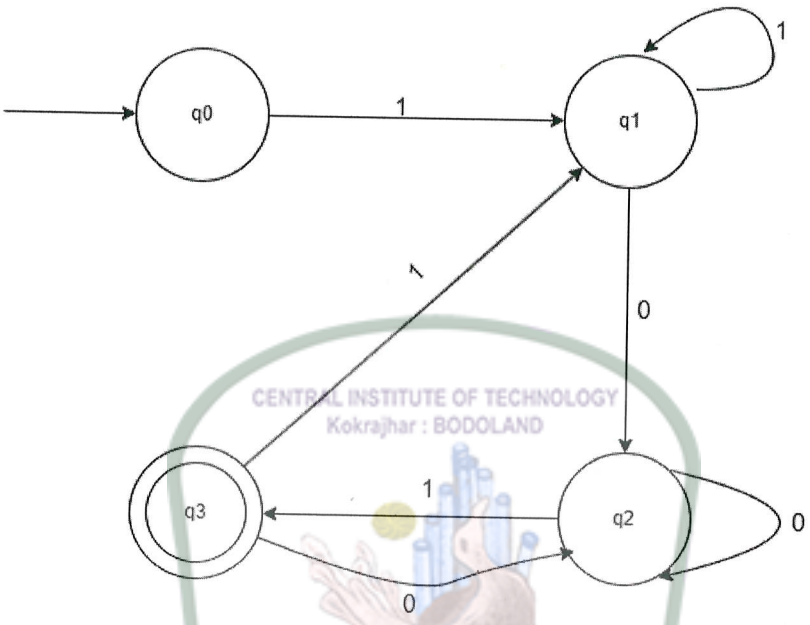
3. a) Construct a DFA equivalent to the grammar 10

$$S \rightarrow aS \mid bS \mid aA,\ A \rightarrow bB,\ B \rightarrow aC,\ C \rightarrow \varepsilon.$$

b) Using pumping lemma show that following language is not regular 10

$$L = \{a^n b^{2n} \mid n > 0\}$$

4. a) 10



Find the regular expression corresponding to the finite automata.

b) Construct a finite automata for 10

i) Binary strings in which every 0 is followed by 11.

ii) Strings over the alphabet {a, b} of the form $(ab)^n$, for example, ababab.

5. Explain with an example 20

a) Conversion of an NFA to DFA

b) Minimization of a DFA

6. Write short notes on: 20

a) Closure properties of regular language

b) Types of Grammars in Chomsky Hierarchy

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