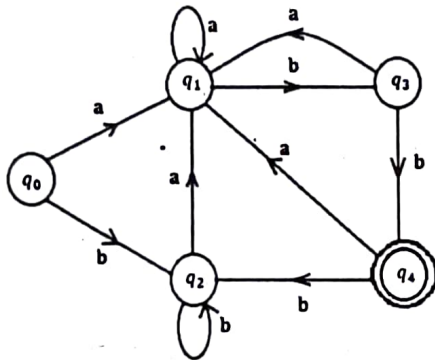


- Note:
1. All questions are compulsory with internal choice.
 2. Draw neat diagrams wherever necessary.
 3. Figures to the right indicate full marks.

Q.1 Answer the following (any FOUR) (20)

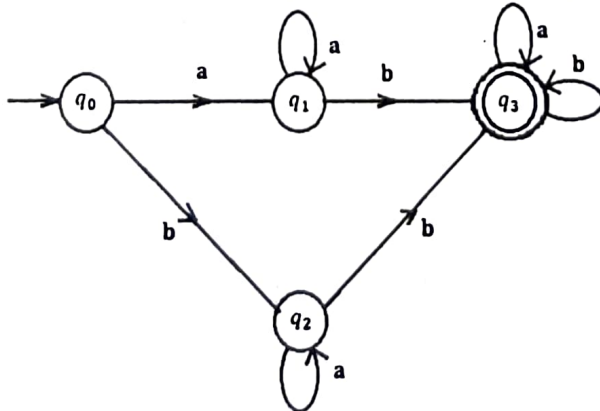
- (a) Draw a DFA and NFA for a given condition.
- i) Draw a NFA which accept all strings over an alphabet {0,1} where string ends with '01'
 - ii) Draw a NFA which accept all strings over an alphabet {a,b} where string starts with 'a'.
- (b) Consider the transition system given in fig. Determine the initial state, the final state and the acceptability of a given string.



Determine initial state, final state and acceptability of string

- i) ababab ii) bababa

- (c) Explain Chomsky classification of grammar.
 (d) Construct a mealy machine that prints 'a' whenever the sequence '01' is encountered in any input binary string.
 (e) Construct minimize DFA equivalent to the following DFA.



- (f) Define Derivation and explain its types.

Q.2 Answer the following (any FOUR) (20)

- (a) Draw a derivation tree for a given grammar.
 $E \rightarrow E+E \quad E \rightarrow E-E \quad E \rightarrow a | b$

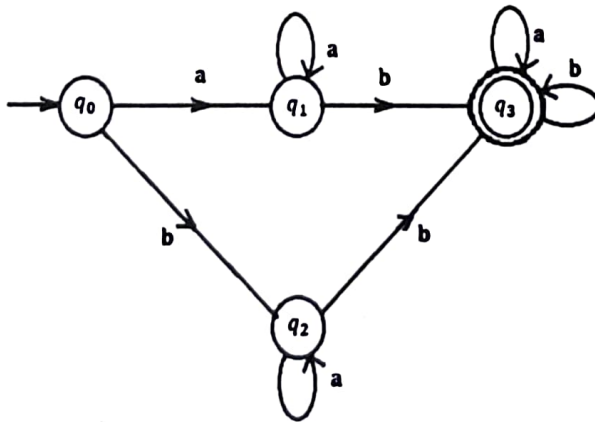
- (b) Explain regular grammar and its type.
- (c) Write a note on Pushdown automata.
- (d) Find a reduced grammar equivalent to the grammar G, having a given production rules.
 $P: S \rightarrow AC \mid B, A \rightarrow a, C \rightarrow c \mid BC, E \rightarrow aA \mid e$
- (e) Write identities of regular expression.
- (f) Convert CFG to CNF.
 $P: S \rightarrow ASA \mid aB, A \rightarrow B \mid S, B \rightarrow b \mid \epsilon$

Q.3 Answer the following (any FOUR) (20)

- (a) Write a short note on turing machine.
- (b) Design Turing machine which can accept language. $L = a^n b^n$
- (c) Write a short note on Halting and unsolvable problem.
- (d) How turing machine can be represented.
- (e) Design an NFA for a language that accepts strings over $\{0,1\}$ in which second last symbol is always 1. Then convert it to its equivalent DFA.
- (f) Explain design of turing machine.

Q.4 Answer the following (any FIVE) (15)

- (a) Draw a NFA which accept all strings over an alphabet $\{0,1\}$ where length of string is 2.
- (b) Consider the transition system given in fig. Determine the initial state, the final state, all collection of set and the input symbol.



- (c) Explain four tuples of context free grammar.
- (d) Describe the following by regular expression.
 - i) Write regular expression for the language accepting all combination of a's except the null string.
 - ii) Write regular expression for the language accepting all the string which are starting with 1 and ending with 0.
 - iii) Write regular expression for the language accepting all the string which are starting and ending with a and having any combination of b's in between.
- (e) Explain the operations performed on languages.
 - i) Union ii) Concatenation iii) Star
- (f) Define NFA, DFA and Turing machine.

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