

- N.B. 1) All questions are compulsory.
2) All questions carry equal marks.
3) Draw neat, labelled diagrams whenever necessary.

Q. 1 Attempt the following (Any FOUR)

(20M)

- (a) Write a short note on Deterministic Finite Automaton.
(b) Consider a Mealy Machine described by the transition table given below.
Construct a Moore Machine equivalent to Mealy Machine.

Present State	Next State			
	a		b	
	state	output	state	output
→q1	q3	0	q2	0
q2	q1	1	q4	0
q3	q2	1	q1	1
q4	q4	1	q3	0

- (c) For the Finite State Machine M, find the acceptability of the strings

- i) 10110011
ii) 11001100
iii) 10100101
iv) 11100011
v) 10101111

State	Input	
	0	1
→ q ₀	q ₂	q ₀
q ₁	q ₃	q ₀
q ₂	q ₀	q ₃
q ₃	q ₁	q ₂

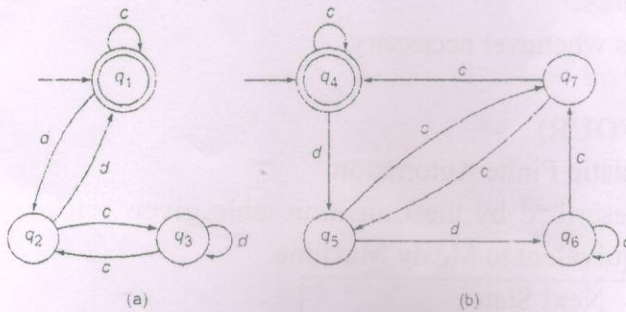
- (d) If $G = (\{S\}, \{0,1\}, P, S)$ where P consists of $S \rightarrow 0S1 \mid 0A \mid 0 \mid 1B \mid 1$, $A \rightarrow 0A \mid 0$, $B \rightarrow 1B \mid 1$. Find $L(G)$.
(e) Let $L = \{a^m b^n \mid m \geq 0 \text{ and } n > 0\}$. Find grammar for it.
(f) Write a note on –
i) Type 0 Grammar
ii) Type 1 Grammar
iii) Type 2 Grammar
iv) Type 3 Grammar

Q. 2 Attempt the following (Any FOUR)

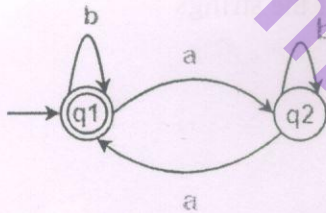
(20M)

- (a) Find a reduced grammar equivalent to the grammar G, having production rules P:
 $S \rightarrow AC \mid B$, $A \rightarrow a$, $C \rightarrow c \mid BC$, $E \rightarrow aA \mid e$.
(b) Construct a PDA that accepts $L = \{0^n 1^n \mid n \geq 0\}$.

- (c) Find out below Automaton M1 and M2 are equivalent to each other or not.



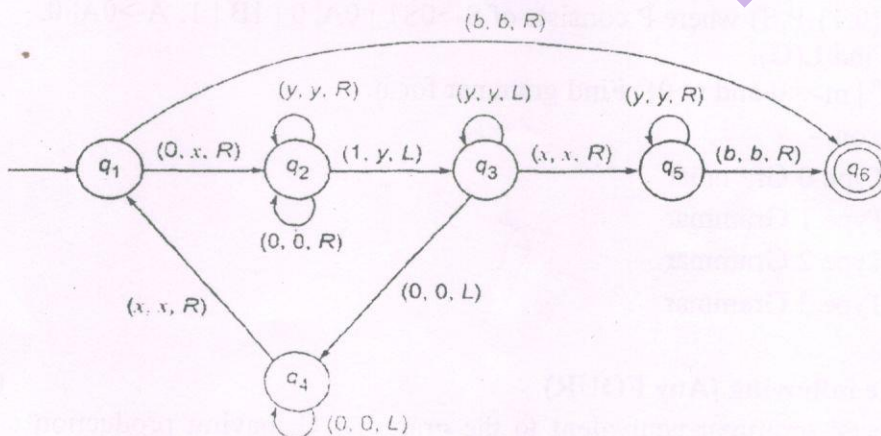
- (d) Explain the Identities for Regular Expressions.
(e) What is ambiguity in Context Free Grammar? If G is the Grammar whose production rule is $S \rightarrow SbS \mid a$. Show that G is ambiguous.
(f) Construct a Regular Expression corresponding to the state diagram described in figure below.



Q. 3 Attempt the following (Any FOUR)

(20M)

- (a) Write a note on Linear Bound Automata model.
(b) Consider the Turing Machine M described by the transition table given below. Describe the processing of string 0011.



- (c) Explain Multitape and Multitrack variant of Turing Machine.
(d) Write a note on Language Decidability.
(e) Explain Church-Turing Thesis.
(f) What is halting problem of Turing Machine?

Q. 4 Attempt the following (Any FIVE)

(15M)

- (a) Construct a deterministic finite automaton equivalent to,
 $M = (\{q_0, q_1, q_2\}, \{a, b\}, \delta, q_0, \{q_2\})$
 Where δ is given by,

State/ Σ	a	b
$\rightarrow q_0$	q_0, q_1	q_2
q_1	q_0	q_1
q_2		q_0, q_1

- (b) Write note on Phase Structure Grammar.
 (c) Describe following sets by regular expression.
 i) Set of all strings of 0's and 1's ending in 00.
 ii) Set of all strings of 0's and 1's beginning with 0 and ending with 1.
 iii) Set of all strings of 0's and 1's whose length is odd.
 (d) What is derivation tree? Define Leftmost Derivation Tree and Rightmost Derivation Tree.
 (e) Explain transition table representation method of Turing machine.
 (f) Write note on Turing Machine.
