



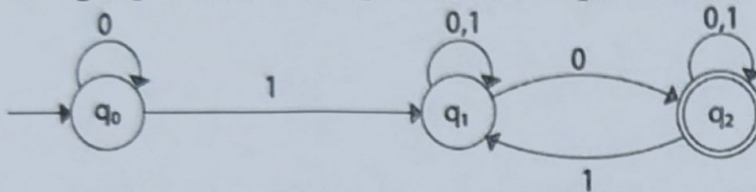
Final Assessment Test (FAT) - November/December 2023

Programme	B.Tech.	Semester	FALL SEMESTER 2023 - 24
Course Title	THEORY OF COMPUTATION	Course Code	BCSE304L
Faculty Name	Prof. Benil T	Slot	G1+TG1
		Class Nbr	CH2023240100678
Time	3 Hours	Max. Marks	100

Part A (10 X 10 Marks)

Answer all questions

01. a) Consider the following automata. Use the extended transition function, to check whether the string $w_1=00100$ and $w_2=0001$ is accepted or not. (5 marks) [10]



- b) If $D = \{ Q_D, \Sigma, \delta_D, q_0, F_D \}$ is the DFA constructed from NFA $N = \{ Q_N, \Sigma, \delta_N, q_0, F_N \}$ by the subset construction, prove that $L(D) = L(N)$. (5 marks)
02. a) Construct an equivalent DFA for the automaton given below (6 marks) [10]

State Input	a	b	ϵ
$\rightarrow 1$	-	-	2,4
2	-	-	3
3	-	3	6
4	4	5	-
5	-	-	6
* 6	-	-	-

- b) Consider the regular expression $R = 0(10)^*1$. Show that this regular expression is also defined by a finite automaton (4 marks)
03. a) Find the Regular expression for the set of all strings denoted by $R^{(12)}$ from the DFA [10]

State Input	a	b
$\rightarrow 1$	3	2
2	1	3
* 3	2	2

04. a) Show that, the grammar $G = \{ (S, A, B), (a, b), (S \rightarrow aB \mid bA, A \rightarrow a \mid aS \mid bAA, B \rightarrow b \mid bS \mid aBB), S \}$ is ambiguous or not? (5 marks) [10]
- b) For the string "aaabbabbba" find Left most Derivation and Right most Derivation. (5 marks)

05. a) Construct the PDA accepting the language $L = \{(ab)^n \mid n \geq 1\}$ by empty stack (6 marks) [10]
 b) Construct Non Deterministic Finite Automata for the given Regular expression using Thompson Rule (4 Marks)
 i) $a.(a+b)^* ab$
 ii) $(a.b)^*$

06. Convert the following CFG into CNF (10 marks) [10]

$$S \rightarrow A \mid AB0 \mid A1A$$

$$A \rightarrow A0 \mid \epsilon$$

$$B \rightarrow B1 \mid BC$$

$$C \rightarrow CB \mid CA \mid 1B$$

07. Prove that the language $L = \{a^n b^n c^n \mid n > 1\}$ is not Context Free Language (10 marks) [10]

08. Design a Turing Machine for the computable function given below (10 marks) [10]

$$f(m, n) = \begin{cases} m - n & \text{if } m > n \\ 0 & \text{otherwise} \end{cases}$$

09. Let L_1 be a Context Free Language and L_2 be a Regular Language. Is $L_1 \cup L_2$ context free ? [10]
 Justify ? (10 marks)

10. Consider the TM M and $w=01$, where $M = (\{q_1, q_2, q_3\}, \{0, 1\}, \{0, 1, B\}, \delta, q_1, B, \{q_3\})$ and δ is [10]
 given by

q_i	$\delta(q_i, 0)$	$\delta(q_i, 1)$	$\delta(q_i, B)$
$\rightarrow q_1$	$(q_2, 1, R)$	$(q_2, 0, L)$	$(q_2, 1, L)$
q_2	$(q_3, 0, L)$	$(q_1, 0, R)$	$(q_2, 0, R)$
$*q_3$	-	-	-

Reduce the above problem to PCP and find whether that PCP has a solution or not? (10 marks)

