

JAMIAHAMDARD
School of Engineering Sciences and Technology
Department of Computer Science & Engineering
Supplementary Examination –2023

Subject: Formal Languages & Automata Theory

Paper Code: BTCSE 503/ BTCSEAI 503

TIME: 3 Hours

MAX. MARKS: 75

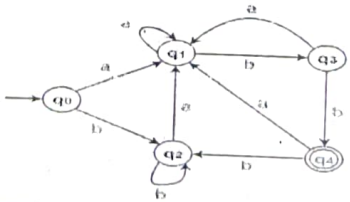
SECTION-A (35 Marks)

❖ *Attempt ALL questions. Each question is of 5 marks.*

Q. No.	Questions	CO*	BL*
1.	Let $L = \{ab, aa, baa\}$. Which of the following strings are in L^4 : abaabaaabaa, aaaaabaaaa, baaaaabaaaab, baaaaabaa ?	CO1	L1
2.	What is Context free grammar? Generate CFG for the grammar the language $L = \{a^n b^n : n \geq 0\}$	CO3	L6
3.	Check whether the grammars G_1 and G_2 are ambiguous or not with proper explanation. $G_1 : S \rightarrow AB aaB \ A \rightarrow aA \lambda \ B \rightarrow bB \lambda \ G_2 : S \rightarrow A B \ A \rightarrow aAb ab \ B \rightarrow abB \lambda$	CO3	L5
4.	Convert the nfa defined by $\delta(q_0, a) = \{q_0, q_1\}$, $\delta(q_1, b) = \{q_1, q_2\}$, $\delta(q_2, a) = \{q_2\}$, $\delta(q_0, \lambda) = \{q_2\}$ with initial state q_0 and final state q_2 into an equivalent dfa.	CO2	L3
5.	State pumping lemma for regular languages. Show that the language $L = \{0^n 1^{2n} n > 0\}$ is not regular.	CO1	L2
6.	Find a dfa that accepts all the strings on $\{0, 1\}$, which are divisible by 4.	CO2	L3
7.	Find regular expressions for the following languages on alphabet $\{a, b\}$ (a) $L = \{w : w \bmod 2 = 0\}$. (b) $L = \{w : w \text{ start and end with different alphabet}\}$. (c) $L = \{a^n b^m : (m+n) \text{ is odd}\}$. (d) $L = \{w : w \text{ has substring } ab\}$.	CO1	L4

SECTION-B (40 Marks)

❖ *Attempt any FOUR questions. Each question is of 10 marks.*

Q. No.	Questions	CO*	BL*
1.	a) Differentiate between NFA and DFA. (3 Marks) b) Minimize the following DFA: 	CO1	L3
2.	Define NPDA (Nondeterministic pushdown automata). Construct an NPDA for the following language $L = \{w \in \{a, b\}^* : n_a(w) = n_b(w)\}$. (10 Marks)	CO2	L2

3.	a) Define Turing Machine and its halt state in detail. (5 Marks) b) What language is accepted by the Turing machine whose transition graph is in the figure below? (5 Marks)	CO3	L6
4.	a) Define Chomsky normal form (CNF) for context free grammar. Reduce the following grammar to CNF : (5 Marks) $S \rightarrow ABAC$ $A \rightarrow aA \mid \lambda$ $B \rightarrow bB \mid \lambda$ $C \rightarrow c$ b) Explain closure properties of context free grammar. (5 Marks)	CO4	L5
5.	Draw DFAs for each of the following languages over the alphabet "$\Sigma = \{0,1\}$": a) All strings that end with 00. b) All strings that contain an even number of 1's. c) All strings which do not contain the substring 10. d) all string that start and end with same alphabet	CO5	L6
6.	Consider the following grammar $S \rightarrow bB / aA$ $A \rightarrow b / bS / aAA$ $B \rightarrow a / aS / bBB$ For the string $w = bbaababa$, find- Leftmost derivation, Rightmost derivation, Parse Tree. Test whether it is ambiguous?	CO2	L3

CO*-Course Outcomes from Syllabus, BL*- Bloom's Taxonomy Levels (1:Remembering, 2:Understanding, 3:Applying, 4: Analyzing, 5: Evaluating, 6:Creating)

END