495388

BCSC 0011 Theory of Automaton and Formal Languages

Course Outcome

CO1: Understand the basic concepts of Context Free languages, Expression and Grammars.
CO2: Analyze the conversion of NFA to DFA, Mealy to Moore and Moore to Mealy.
CO3: Analyze the process to convert regular expression to DFA, DFA to regular expression, and minimization of DFA.
CO4: Develop the PDA for the context free language and context free grammar.
CO5: Analyze that the grammar is ambiguous or unambiguous.
CO6: Apply the process to convert CFG to CNF and GNF.
CO7: Understand the concept of Turing machine and its variants.
CO8: Design the Turing machine for the real-world application.

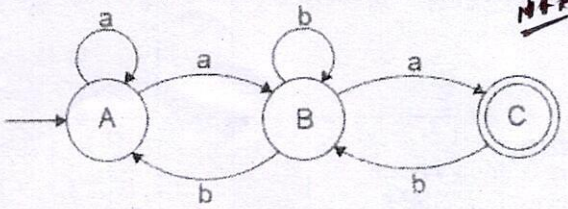
Printed Pages:03 **University Roll No. .....**

End Term Examination, Odd Semester 2024-25
B.Tech CSE, III[rd] Year, V[th] Sem
BCSC 0011 Theory of Automata and Formal Languages

Time: 3 Hours **Maximum Marks: 50**

Section – A

Attempt All Questions 4 X 5 = 20 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	Design a DFA for the input alphabet 0,1 in which the string must be begins with 0 and ends with 1.	4	CO2	A	C
2	Find out the regular expression for the given ~~DFA~~ NFA 	4	CO3	A	P
3	Construct the PDA for the language having equal number of a and b over input alphabet (a, b).	4	CO4	C	C
4	What is a Recursive Enumerable Language? Prove that if L is recursive language, then the complement of L i.e. L' is also recursive.	4	CO5	R	F
5	Imagine you are part of a team designing advanced computational systems for different real-world applications. Each application requires a unique kind of computational model to address its specific constraints and goals. Your task is to understand and choose from various Turing Machine variants to solve the following challenges:	4	CO7	An	C

	A. Parallel Data Processing B. Simultaneous Data Storage C. Exploring Multiple Solution D. Simulating General Purpose Machine				

Section – B

*Attempt **All** Questions* 3 X 5 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
6	Explain the Church-Turing Hypothesis, provide reasoning and justification for why the Church-Turing Hypothesis is not considered as a theorem?	3	CO5	A	P
7	For the given CFG: S → 0S | 1AA A → 0 | 1A | 0B B → 1 | 0BB For the input string w = 0100110 A. Construct the left most derivation B. Construct the right most derivation C. Derivation tree	3	CO5	E	F
8	Convert the given CFG into their corresponding CNF E → E + E | E * E | a | b | c	3	CO6	E	P
9	Construct the PDA from the given CFG. S → 0SX | 1SY | ε X → 1 Y → 0	3	CO4	C	P
10	You are part of a team working on a text-processing engine for a large-scale document editor. The engine must efficiently check and process structured text, such as HTML, programming code, or formulas, by using predefined grammars. To ensure that the engine operates efficiently, you are tasked with simplifying the given context-free grammar (CFG) used for parsing. CFG: S → aAa, A → Sb | bCC | DaA, C → abb | DD, D → aDA, E → aC	3	CO6	E	C

Section – C

*Attempt **All** Questions* 5 X 3 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
11	Convert the given PDA A, into their CFG: A = ({q0, q1}, {a, b}, {a, Z0}, δ, q0, Z0, {}) δ (q0, a, Z0) = (q0, aZ0) δ (q0, a, a) = (q0, aa) δ (q0, b, a) = (q1, a) δ (q1, b, a) = (q1, a) δ (q1, a, a) = (q1, ^) δ (q1, ^, Z0) = (q1, ^)	5	CO4	A	P
12	Convert the grammar into their equivalent GNF: S → AA | a A → SS | b	5	CO6	E	C
13	You are working on developing a data verification system for a warehouse inventory application. The system processes inventory data strings, which are structured as follows: 1. The first half of the string represents the incoming shipment (items represented by **a** and **b**). 2. The second half of the string represents the outgoing shipment, which must be reverse to the incoming shipment. Your task is to **design a Turing Machine** that can process these strings and determine if they are valid. If the incoming and outgoing shipments is reverse (i.e., the string conforms to the format $\mathbf{ww^R}$), the Turing Machine should accept the string. Otherwise, it should reject it.	5	CO8	C	C