



Academic year 2022-2023 (Even Sem)

DEPARTMENT OF  
**INFORMATION SCIENCE & ENGINEERING**

Date	22 <sup>nd</sup> August 2023	Maximum Marks	50
Course Code	21IS44	Duration	90 Mins
Sem	IV Semester	CIE - II	
THEORY OF COMPUTATION			

Sl. No.	Questions	M	BT	CO												
1.a	Define PDA and instantaneous description (ID). Construct PDA to recognize set of all palindromes over $\Sigma = \{a,b\}$ . Show sequence of IDs in processing 'abba'.	08	L4	CO <sub>1</sub>												
1.b	Identify the language the CFG generates? $S \rightarrow aaS \mid bbS \mid Saa \mid Sbb \mid abSab \mid abSba \mid baSba \mid baSab \mid$	02	L3	CO <sub>1</sub>												
2.a	List the steps to convert the given CFG to equivalent PDA by empty stack. Convert the CFG below to its equivalent PDA using the steps given by you. $I \rightarrow a \mid b \mid I_a \mid I_b \mid I_0 \mid I_1$ $E \rightarrow I \mid E * E \mid E + E \mid (E)$	05	L3	CO <sub>3</sub>												
2.b	Summarize the languages accepted by PDA with an example for each.	05	L2	CO <sub>1</sub>												
3.a	How to find an equivalent CFG from a given PDA? Convert the following PDA to a grammar: $P = (\{p,q\}, \{0,1\}, \{X,Z\}, \delta, p, z, \Phi)$ where $\delta$ is given by: $\delta(p, 0, Z) = \{(p, XZ)\}$ $\delta(p, 0, X) = \{(p, XX)\}$ $\delta(p, 1, X) = \{(q, \epsilon)\}$ $\delta(q, 1, X) = \{(q, \epsilon)\}$ $\delta(q, \epsilon, X) = \{(q, \epsilon)\}$ $\delta(q, \epsilon, Z) = \{(q, \epsilon)\}$	06	L3	CO <sub>3</sub>												
3.b	Simplify the following grammar:	04	L3	CO <sub>1</sub>												
4.a	Define DPDA. Construct DPDA equivalent to the DFA whose transition table is as below. Here A is Start state and B is final state. <table border="1"><tr><td><math>\delta</math></td><td>a</td><td>b</td></tr><tr><td>A</td><td>A</td><td>B</td></tr><tr><td>B</td><td>C</td><td>A</td></tr><tr><td>C</td><td>A</td><td>B</td></tr></table>	$\delta$	a	b	A	A	B	B	C	A	C	A	B	04	L3	CO <sub>1</sub>
$\delta$	a	b														
A	A	B														
B	C	A														
C	A	B														



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4.b	Define GNF grammar. Given below a CFG G, find a CFG G' in GNF generating $L(G) - \{$	06	L3	CO 2
5.a	If $L_1$ is CFL and $L_2$ is regular language, then prove that $L_1 L_2$ is a CFL.	05	L2	CO 2
5.b	Construct the parse tree, LMD and RMD for the string aabbabab where the grammar G is given by	05	L2	CO 1

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars		CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	Test	Max Marks	28	11	11	--	--	15	27	8	--	--

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