

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Formal Languages and Automata Theory
Program: B. Tech.-CSE- (Honors)
Course Code: CSEG2035P

Semester : III
Time : 03 hrs.
Max. Marks : 100

Instructions:

SECTION A (Attempt all questions)

S. No.	Question	Marks	CO
Q 1	State and prove Arden's theorem. Discuss its applications.	3+1	CO1
Q 2	Discuss the closure properties of context free languages.	4	CO2
Q 3	Describe the Chomsky Hierarchy of grammar.	4	CO3
Q 4	Define the following terms: i. Recursive and Recursive enumerable language ii. Decidable and undecidable language	4	CO4
Q 5	Prove that regular languages are closed under intersection operation.	4	CO2

SECTION B (Attempt all questions)

Q 6	Construct a minimized DFA accepting all strings over {0, 1} ending in 010 or 0010.	10	CO1
Q 7	Design a Moore machine which will count how many times substring aab occurs in a long input string composed of {a, b}. Count can be maintained by printing 1 each time substring aab occurs.	10	CO2
Q 8	Find a grammar in Chomsky normal form equivalent to $S \rightarrow AACD \quad A \rightarrow aAb \Lambda \quad C \rightarrow aC a \quad D \rightarrow aDa bDb \Lambda$ OR Eliminate the useless symbols from the following grammar: $S \rightarrow AB AC \quad A \rightarrow aC a \quad C \rightarrow c \quad D \rightarrow d$	10	CO3
Q 9	Show that Fibonacci numbers are generated by primitive recursive function.	10	CO4

SECTION-C (Attempt all questions)

Q 10	i. Using pumping lemma prove that the language $L = \{a^p \mid p \text{ is a prime number}\}$ is a non-regular language. ii. Prove that minimization of DFA is a decidable problem.	10*2= 20	CO1 CO4
Q11	i. Design a Turing machine for the two's complement of a binary number and show the processing of one string. ii. Design a PDA for $L = \{x \mid x \in (a, b)^* \text{ and } n_a(x) > n_b(x)\}$ and show the processing of one valid and one invalid string. OR	10*2= 20	CO3

	<ul style="list-style-type: none">i. Design a Turing machine to recognize an arbitrary string divisible by 4 from {0, 1, 2}ii. Show that set of all strings over {a, b} consisting of equal number of a's and b's is accepted by deterministic push down automata.		
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