



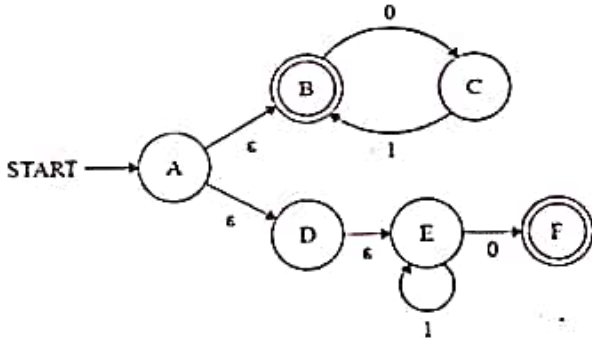
VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test I – January 2023

Programme	: M.Tech. Computer Science and Engineering with Specialisation in Business Analytics (5-year integrated programme)	Semester	: WINTER 2022-23
Course	: Theory of Computation & Compiler Design	Code	: CSE3038
Faculty	: Dr. P Prakash, Dr. K Sathyarajasekaran	Slot	: A1+TA1
Time	: 90 Minutes	Class Nbr	: CH2022235001912 CH2022235001913
		Max. Marks	: 50

Answer ALL the questions

Q.No.	Questions	Marks
1	Design NFA for the following a) $L_1 = \{w \mid w \in \{a, b\} \text{ the string has either aba or bab as substring.}\}$ b) $L_2 = \{w \mid w \in \{a,b\} \text{ contains the strings that starts with a or b and end with bab}\}$	10
2.	A bag contains n balls with three different colours namely red, blue and green. A person wishes to choose a collection of balls in the following way: first two balls will be either red or green followed by any number of blue balls. The last four balls would be either blue balls or two red balls and two green balls. Design a deterministic finite automaton.	10
	Construct an NFA without ϵ -moves for the given ϵ -NFA. 	10
	A developer produces high-level language coding. The code is not passed as it is, into the compiler. Also, the compiler alone could not produce the actual low-level language code. Why can the compiler not perform the operation of converting a high-level code to a low-level one? Further, describe how this operation could be done.	10

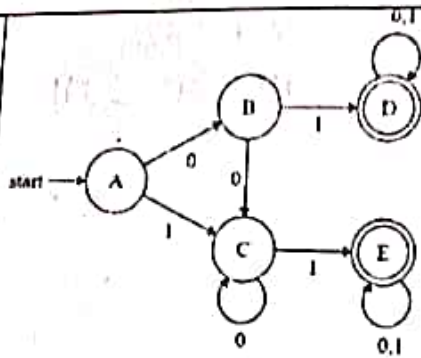


Figure 1. FA 1

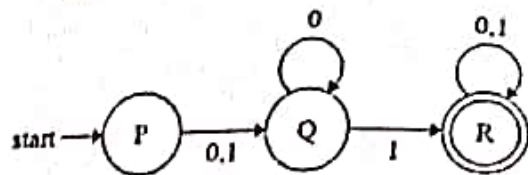


Figure 2. FA 2

10

Using equivalence method test the two given finite automata (FA1 and FA2) are equal or not.

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Continuous Assessment Test II – March 2023

Programme	: M.Tech. Computer Science and Engineering with Specialisation in Business Analytics (5-year integrated programme)	Semester	: WS 2022-23
Course	: Theory of Computation & Compiler Design	Code	: CSE3038
Faculty	: Dr. P Prakash, Dr. K Sathyarajasekaran	Slot	: A1+TA1
Time	: 90 Minutes	Class Nbr	: CH2022235001912 CH2022235001913
		Max. Marks	: 50

Answer **ALL** the questions

Q.No.	Questions	Marks
1.	<p>A girl collects three different shells from the sea shore and arranges them in an order where blue colour comes first followed by red colour and finishes in green colour, the count of red colour shell and green colour shell may not be equal but the count of blue shells should be the total count of red and green shells.</p> <p>Design a pushdown automaton (PDA) with which the checking process can be done. Validate your model.</p>	10
2.	<p>A fruit juice shop owner instructs his employees to buy apple, bananas, kiwis and watermelon from a wholesale market and also instructs them to arrange fruits in the bag such that the watermelons are at the bottom and on top of that apples, over the apples kiwis and bananas are on the top to protect from smashing. The number of bananas bought should be thrice as that of watermelons and apples should be twice the count of kiwis. The owner wants to check whether the arrangement and count made by the employees are same using a machine.</p> <p>a) Construct a context free grammar that may represent the above collection sequence. (5M)</p> <p>b) Identify two sample strings and validate it with the generated CFG. (5M)</p>	10
3.	<p>Represent the following grammar G into Chomsky Normal Form.</p> $G = (\{S, A, B, C, D\}, \{a, b\},$ $\{S \rightarrow bA \mid aB \mid D$ $A \rightarrow bAA \mid aS \mid a$ $B \rightarrow aBB \mid bS \mid b$ $C \rightarrow ba \mid ab$ $D \rightarrow AD\},$ $S)$	10

4.	<p>Consider the given grammar and apply CYK parsing algorithm to validate the string "abbba" and comment on the result.</p> $S \rightarrow DA \mid CB$ $A \rightarrow CS \mid DE \mid a$ $B \rightarrow DS \mid CF \mid b$ $E \rightarrow AA$ $F \rightarrow BB$ $C \rightarrow a$ $D \rightarrow b$	10
5.	<p>Consider the following CFG $G = (N = \{S, A, B, C, D\}, T = \{a, b, c, d\}, P, S)$ where the set of productions P is given below:</p> $S \rightarrow A$ $A \rightarrow BC \mid DBC$ $B \rightarrow Bb \mid \epsilon$ $C \rightarrow c \mid \epsilon$ $D \rightarrow a \mid d$ <p>Construct the corresponding parsing table using the predictive parsing LL method and show the stack contents, the input and the rules used during parsing for the input $w = dbb$</p>	10

4/11/23

Final Assessment Test (FAT) - APRIL/MAY 2023

Programme	M.Tech. (Integrated)	Semester	Winter Semester 2022-23
Course Title	THEORY OF COMPUTATION AND COMPILER DESIGN	Course Code	CSE3038
Faculty Name	Prof. Prakash P	Slot	A1+TA1
		Class Nbr	CH2022235001912
Time	3 Hours	Max. Marks	100

PART-A (10 X 10 Marks)

Answer All questions

01. Is it possible to design a Pushdown automaton for the language, $L = \{ a^n b^m c^{2n} \mid n, m \geq 1 \}$? Justify your answer. [10]
02. a) Design a Deterministic Finite Automata, M for the language that accepts the numbers which are divisible by 3, where the numbers are in binary representation. [10]
 b) For the DFA designed in 2(a) construct the regular expression R. Justify $L(M) = L(R)$.
03. Construct the minimized DFA for the Finite Automata shown in figure 1. [10]

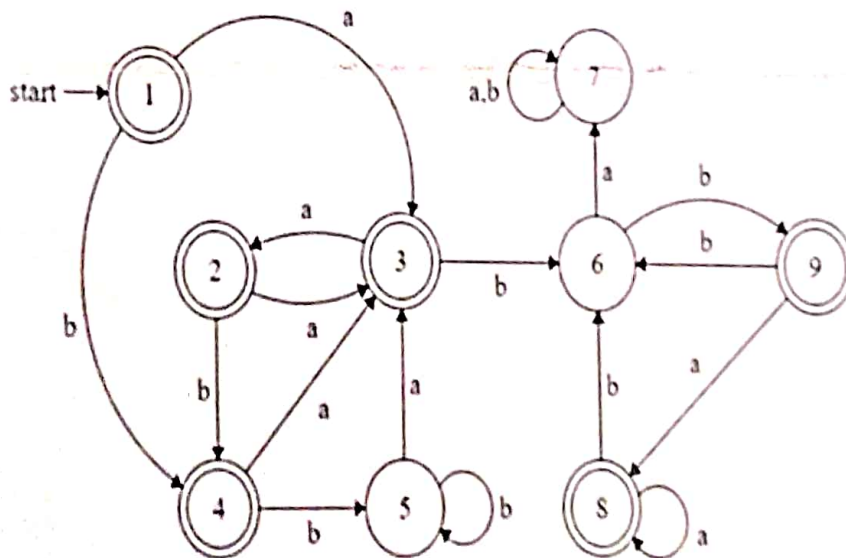


Figure 1

04. Check and prove whether the following languages are regular or not. [10]
 - a) $L = \{ a^{n+m} b^n c^m \mid n \text{ is odd, } m \text{ is even} \}$ (5M)
 - b) The language $L = \{ ww^c \mid w \in \{0, 1\}^* \text{ and } w^c \text{ is the complement of } w \}$ is regular. (5M)
 (NOTE: w is 010 then w^c is 101)
05. Design a Turing machine to compute the language, [10]
 $L = \{ a^p b^q c^p d^{2q} \mid p, q > 0 \}$
06. List out all the criteria that need to be analysed to perform optimization of a compiler. Provide suitable examples for each. Can a compiler perform without having this optimization phase? Justify. [10]

07. $E \rightarrow E + E$

$E \rightarrow E * E$

$E \rightarrow E - E$

$E \rightarrow E \wedge E$

$E \rightarrow E / E$

$E \rightarrow (E)$

$E \rightarrow I$

$I \rightarrow I \text{ Digit}$

$I \rightarrow \text{Digit}$

Write down the Syntax Directed Definition (SDD) for the above-given grammar and test it with the string " $((123-118) \wedge 2) + 2$ " by using the action of the LR parser.

[10]

08. $S \rightarrow L = R$

$S \rightarrow R$

$L \rightarrow *R$

$L \rightarrow \text{id}$

$R \rightarrow L$

Generate the item sets and bottom-up parsing table for the given production rules.

[10]

09. List down the various forms of Intermediate Code and represent the code given below in all the formats.

$v2 = 10;$

$v3 = 20;$

$v1 = v2 + v3;$

$v4 = v5 + 34 - (45 * v1 - v2);$

[10]

10. The area of the circle is calculated using the formula

$\text{Area} = 3.14 * r * r$

for the above said statement specify the input and output of each phase of the compiler and Discuss how the work is processed in each phase of the compiler.

