Reg. No.:

Name :

VIT®

Vellore Institute of Technology

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

Continuous Assessment Test II – October 2023

Programme	:	**B.Tech CSE**	**Semester**	:	FALL 2023-24
Course	:	Theory of Computation	**Code**	:	BCSE304L
			Slot	:	F1+TF1
Faculty	:	Dr. S. Suseela Dr. K. Sathyarajasekaran	**Class Nbr**	:	CH2023240101110 CH2023240101108
Time	:	90 Minutes	**Max. Marks**	:	50

Answer ALL the questions

Q.No.	Questions	Marks
1.	Design a Push Down Automata for the following language, a) $L= \{a^{2n} b^m c^p d^q e^{n+p} \mid n, m, p, q>0\}$ (8 Marks) b) Validate a sample string of your choice for the given language over your machine. (2 marks)	10
2.	Let the language L be defined as, $L \rightarrow L_1L_2$ Where, $(ab)^* a (b \mid a)^+$ is the regular expression for the language L_1 $(a^* \mid b^*) \mid (ab \mid ba)^*$ is the regular expression for the language L_2 Construct a Context-Free Grammar that generates all strings in L.	10
3.	Prove whether the following languages are regular or not regular. a) L= {w | w {a, b}* and for every arrival of "a" there should be two "b's" in the string.(5 Marks) b) $L= \{0^i 1^{j+i} 2^{i+j} \mid i,j \geq 0\}$(5 Marks)	10

4.	Given the following Context Free Grammar $G_1= (\{X, Y, Z, S, T\}, \{0,1\}, P, X)$ with the set of all productions,
	P= {
	$X \rightarrow 0Y1 \mid 1Y0 \mid Z11 \mid Y$
	$Y \rightarrow 0Y \mid 1Y \mid \varepsilon \mid Z$
	$Z \rightarrow 0Z0 \mid 1Z1$
	$S \rightarrow ZS \mid SY$
	$T \rightarrow ZSY \mid YSZ \mid S$
	}
		10

	a) For the above given grammar G_1 provide an equivalent grammar G_2 in a simplified form. (6 Marks) b) Write any two words generated by L (G_2). For the 1st generated word, perform LMD and RMD. (4M) ***NOTE:*** *word length should be greater than 7.*	
5.	$L = \{a^i b^{2j} / i, j>0 \text{ and } i=2j\}$ a) Construct Context Free Grammar G_1 for L. (4 Marks) b) For the generated CFG G_1 in question **5(a)** derive an equivalent grammar G_2 in Chomsky Normal Form. (6 Marks)	10

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