25/05/2022 (E)

SOMAIYA VIDYAVIHAR UNIVERSITY

Semester: January 2022 – May 2022 **Maximum Marks: 100** **Examination: ESE Examination** **Duration: 3 Hrs**		
Programme code: 01 **Programme: B.Tech**	**Class:** SY	**Semester:** IV **(SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**	**Name of the department:** COMP	
Course Code: **116U01C404**	**Name of the Course: Theory of Automata with Compiler Design**	
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary		

Question No.		Max. Marks
Q1 (a)	Given the alphabet set Σ={0,1}. Write Regular Expression for the following languages : i. Language L1 where all words must start with 0 and end with 1. ii. Language L2 where all words must contain 11. iii. Language L3 where all words either start with 1 or end with 01 or both. iv. Language L4 where all words are not having three or more consecutive 1s.	 2 2 3 3
Q1 (b)	Consider L1 = {aaab*} and L2= {a*bbb}, find regular expression for L1 U L2, L1 ∩ L2 and –L1 (complement of L1) and draw their respective Automata. OR i. Design a DFA for the Language L={w | w is of even length and begins with 01} ii. Design Mealy Machine to convert each occurrence of substring 1000 by 1001	10 5 5
Q2 (a)	i. Write a CFG for the Language L over the alphabet ∑ = { (,) } where the words are balanced parenthesis. e.g (( )) ( ) ( ) (( )). ii. Construct a Parse tree using LMD showing that the string ( ) ( ) ( ) is derived by the CFG. iii. What is the necessary condition when a CFG is called an Ambiguous grammar?	5 5 4
Q2 (b)	Eliminate Null Production from the given Grammar: S->ACB / CbB / Ba A-> da / BC B-> bC / ε C-> ab / ε	6

Q3 (a)	Construct PDA for the given CFG: S -> AB A -> BB B -> AB A -> a B -> a B -> b	10
Q3 (b)	Design PDA for recognizing $L = \{a^n b^{2n+1} \mid n>=1\}$. OR Convert the following grammar to Greibach Normal Form G = ({A,B,C}, {a,b},P,S) Where P consists of the following A-> BC B->CA / b C->AB / a	10
Q4 (a)	Design Turing Machine to increment the value of any binary number by one. The output should also be a binary number with value one more the number given. Show the simulation of input string "101101" on your Turing Machine. OR Design a TM for even length palindrome $L= ww^R \mid w \in (a+b)^*$. Show the simulation of your Turing Machine with the help of an example.	15
Q4 (b)	Write a short note on Multitape Turing Machine.	5
Q5 (a)	Explain Pumping Lemma. Prove that the following language on alphabet = {a,b} is not CFL: $L=\{a^n b^{2n} a^n \mid n>0\}$	5 5
Q5 (b)	Write short note on any two: i. Post correspondence Problem ii. Rice's Theorem iii. Recursively Enumerable Language iv. Halting problem of Turing Machine	10