Question Paper Pattern(For Online Examination-Max.Marks:60)

K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22(Autonomous College Affiliated to University of Mumbai)

End Semester Exam

Nov –Dec2021

B.Tech-Program

Examination: TY Semester V

Course Code: 1UCEC501 and Course Name: Theoretical Computer Science

Duration:03Hours   **Max.Marks:60**

Instructions:
(1) All questions are compulsory.
(2) Draw neat diagrams wherever applicable
(3) Assume suitable data, if necessary.

Q.No.	Question	Max.Marks
Q 1	**Solve any six questions out of eight:**	12
i)	What is deductive proof.	2
ii)	Explain regular expression with an example.	2
iii)	When we say a problem is decidable? Give an example of undecidable problem?	2
iv)	What are the applications of pumping lemma.	2
v)	Explain CFL with an example	2
vi)	Define Deterministic PDA. What are the components of PDA ?	2
vii)	What is the language accepted by TM? Write down the application of TM?	2
viii)	Give the applications of finite state automata.	2
Q.2	**Solve any four questions out of six.**	16
i)	State that whether a following Language is Regular or not. $L = \{WW^R \mid \|W\|=2 \text{ over } \sum=\{a,b\}\}$	4
ii)	Convert the following NFA with ε moves to DFA without ε moves.	4
iii)	Design a multi head Turing Machine for checking whether a binary string is a palindrome or not. Show the ID for 1001	4

iv)	Define Pumping Lemma for Regular Languages. Prove that the language L = {an: n is a prime number} is not regular	4
v)	Construct PDA to accept all strings of 0's and 1's such that number of 1's is less than number of 0's by final state method.	4
vi)	What is the language accepted by the following finite automata	4
Q.3	**Solve any two questions out of three.**	**16**
i)	Design finite state machine to add 2 binary numbers of equal length.	8
ii)	Construct the PDA accepting the language $L=\{a^{2n}b^n \mid n>=1\}$	8
iii)	Illustrate the Turing machine for computing $f(m, n)=m-n$ (proper subtraction).	8
Q.4	**Solve any two questions out of three.**	**16**
i)	Construct PDA from the following Grammar. $S \rightarrow aB$ $B \rightarrow bA/b$ $A \rightarrow aB$	8
ii)	Design regular grammars for the following languages. i) Strings of a's and b's having strings without ending with ab. ii) Strings of 0's and 1's with three consecutive 0's.	8
iii)	Give proof for the statement: if L is a context free language, then can we construct a pda A accepting L by empty store, i.e. L=N(A).	8