COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Vishrambag, Sangli - 416415

Second Year B.Tech. (Computer Science and Engineering)

END SEMESTER EXAMINATION (EVEN SEM AY 2021-22) JUN. - 2022

Formal Language and Automata Theory (5CS222)

ESE

Day, Date and Time: Tuesday, 07/06/2022, 02.00PM to 04.00PM

PRN: _____

Max Marks: **60**

IMP: Verify that you have received question paper with correct course, code, branch etc.

Instructions:
a) All questions are compulsory.
b) Writing question number on answer book is compulsory otherwise answers may not be assessed.
c) Assume suitable data wherever necessary.
d) Figures to the right of question text indicate full marks.
e) Mobile phones and programmable calculators are strictly prohibited.
f) Except PRN anything else writing on question paper is not allowed.
g) Exchange/Sharing of stationery, calculator etc. not allowed.

Text on the right of marks indicates course outcomes (only for faculty use).

			Marks	
Q1	A)	Explain the pumping lemma for regular language. Show that L = {a^ n : n is a prime number} is not regular.	6	CO1
Q1	B)	Explain the Kleene's theorem with its proof. Apply all the three parts of the Kleene's theorem with the suitable example.	8	CO2
Q2	A)	Design the context free language generated by each of the following production rules. Draw derivation tree for each to check whether the string is to be accepted from given language. (a) S→ aS, S→ bS, S→ ε (b) S→ aS, S→ a, S→ ε (c) S→ aS, S→ aA, A→ bA, A→ b (d) S→ aSa, S→ bSb, S→ ε	8	CO2
Q2	B)	What is parsing? Describe what is Top-Down & Bottom-up parsing with example.	6	CO2

Q3 Simplify the context free grammar with various steps included such as follows. Explain in details.

Eliminate Null Production from below CFG:

$S \rightarrow ABC \mid CbB \mid Ba$

$A \rightarrow da \mid BC$

$B \rightarrow gC \mid \varepsilon$

$C \rightarrow h\alpha \mid \varepsilon$

Eliminate the unit-production from the CFG:

$S \rightarrow Aa \mid B \mid C$

$A \rightarrow a \mid bC \mid B$

$B \rightarrow A \mid bb$

Eliminate the useless symbols and productions from CFG:

$S \rightarrow aZ \mid SY \mid XA$

$X \rightarrow bSZa$

$Y \rightarrow aSY \mid bYZ$

$Z \rightarrow aYZ \mid ad$

$A \rightarrow ab \mid aA$

Q4 What are different Normal Form? Explain in details. Convert following CFG into GNF with the illustrations.

$S \rightarrow XYBB$

$B \rightarrow b \mid SB$

$A \rightarrow a$

$X \rightarrow b$

Q5 What is Turing Machine? Define Turing Machine with suitable diagram. Explain different variations of Turing Machine.

Q6 Design the Turing machine for addition, Subtraction and Multination for the following examples such as: (1) F (5+4) =9 (2) F(4-2)=2 (3)F(3*2)= 6. Construct input tape and transition table to each operation.