WALCHAND COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Vishrambag, Sangli – 416415

Second Year B.Tech. Computer Science and Engineering

ESE , EVEN SEMESTER, AY 2022-23

Formal Language and Automata Theory (6CS221)

| ESE |

PRN: _____

y & Date: Thursday, 11/05/2023   Time : 10.00 am to 12.00 noon

Max Marks: | 50 |

IMP: Verify that you have received question papers 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, smart gadgets 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)	What is a parse tree? Explain Top-down and Bottom-up parsing with suitable example	6	CO1
	B)	Define Push Down Automata (PDA). Write down the stepwise algorithm and construct a PDA for the language $L = \{a^n b^n \mid n >= 0\}$	6	CO3
	C)	Consider the following statements	3	CO3

1. PDA is more powerful than FSM   2. FSM is more powerful than PDA

3. Both are having equal power.

Select appropriate option from the above choices and justify the same using suitable example

Q2	A)	what is non-deterministic Turing Machine? Explain ACCEPT and REJECT scenario in case of non-deterministic Turing Machine	4	CO1
	B)	Consider the following transition table for a Turing machine functionality. Simulate/Analyze the working of the given Turing machine considering the input string '11110111'. Comment on the functionality of the Turing machine	4	CO3

Here $I = \{0, 1, ;\}$

$S = \{q_0, q_1, q_2, q_3, q_4, q_5 = halt\}$

$D = \{L, R, N\}$

S	0	1	;
q_0	R	q_1,R	q_5,N
q_1	q_0,R	q_2,R	q_5,N
q_2	q_0,R	q_3,L	q_5,N
q_3	.	0q_4,R	.
q_4	.	q_0,R	.
q_5	.	.	.

C) Explain 1) Basic construction of Turing machine   2) Universal Turing machine

Q3 A) Convert following CFG into Chomsky Normal Form.
S --> ABA   A --> aA | ε   B --> bB | ε

B) What is Greibach Normal Form (GNF)? Convert following grammar to GNF
S --> ABA | AB |BA |AA| A| B
A --> aA | a
B --> bB | b

Q4 A) Demonstrate pumping Lemma for CFG with suitable example

B) Write a Context Free Grammar for generating strings over ∑ = {a} containing any number of a's, { ε, a, aa, aaa, ...}

Q5 A) What is Finite State Machine? consider following two regular languages
L = {Aa, Bb, Cc, Dd }   D = {Aa, Ff, Kk, Dd }   Find out
1. L ∪ (L∩D)   2. L ∩ (L ∪ D)   3. LD

B) Design a FA from the following transition table and comment on type of FA (NFA/DFA)

State	0	1
→q0	q3	{q1, q2}
q1	qf	φ
q2	φ	q3
q3	q3	qf
*qf	φ	φ

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