Laxmi Singh Charitable Trust's (Regd.)
THAKUR COLLEGE OF
ENGINEERING & TECHNOLOGY
Website : www.tcetmumbai
Autonomous College Affiliated to University of Mumbai
Approved by All India Council for Technical Education(AICTE) and Government of Maharashtra(GoM)
Conferred Autonomous Status by University Grants Commission (UGC) for 10 years w.e.f. A.Y 2019-20
Amongst Top 200 Colleges in the Country, Ranked 193rd in NIRF India Ranking 2019 in Engineering College category
• ISO 9001:2015, 14001:2015, 50001:2018 Certified • Programmes Accredited by National Board of Accreditation (NBA), New Delhi
• Institute Accredited by National Assessment and Accreditation Council (NAAC), Bangalore
Estd.2001

IN-SEMESTER EXAMINATION-I
TE (Semester-V)
SUBJECT – Automata Theory

Branch: IT
Div.: IT
Duration: 60 Minutes
Date: 28/08/2024
Timing: 12:00 PM to 1:00 PM
Maximum Marks: 20

Instructions –
All questions are compulsory.
Assume suitable data wherever necessary and state the assumptions made.
Diagrams / sketches should be given wherever necessary.
Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
Figures to the right indicate full marks.

Q.1		**Answer any 5 of the following questions**	**Marks**	**Course Outcomes**	**Learning Levels**
	a.	Illustrate if L be a set accepted by an NFA then there exists a DFA that accepts L.	2	1	R
	b.	Give the DFA accepting the language over the alphabet 0,1 that have the set of all strings that either begins or end(or both) with 01.	2	1	A
	c.	Construct NFA for (11+0)*(00+1)*	2	1	C
	d.	Define a regular expression and explain its significance in language theory.	2	2	R
	e.	Write any three applications of regular expressions in any programming language	2	2	U
	f.	Explain the concept of closure under Kleene star operation for regular languages. Provide an example to illustrate.	2	3	A
	g.	Define the concept of an inverse homomorphism and discuss its implications for regular languages.	2	3	U
Q.2	a.	Design a DFA for the following regular expression (ab+ba)(a+b)*	5	2	A
		OR			
	b.	Construct DFA for the following regular expression (0+1)*(011+110)	5	2	C
Q.3	a.	Apply the Pumping Lemma to prove that the language $L=\{ww^R \mid w\in\{0,1\}*\}$ is not regular.	5	3	AN
		OR			
	b.	State the Pumping Lemma and prove that the language $L=\{a^nb^nc^n \mid n\geq 0\}$ is not regular.	5	3	AN

Lengkh Singh Charitable Trust's (Mgd.)
THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY
Autonomous College Affiliated to University of Mumbai
Approved by All India Council for Technical Education(AICTE) and Government of Maharashtra(GoM)
Conferred Autonomous Status by University Grants Commission (UGC) for 10 years w.e.f. A.T 2019-20
Amongst Top 200 Colleges in the Country, Ranked 195 in NIRF India Ranking 2019 in Engineering College category
• ISO 9001:2015, 14001:2015, 50001:2018 Certified • Programmes Accredited by National Board of Accreditation (NBA), New Delhi
• Institute Accredited by National Assessment and Accreditation Council (NAAC), Bangalore
Estd. 2001
Website : www.tcetmumbai.in

IN-SEMESTER EXAMINATION-II

T.E. (Semester-V)

SUBJECT – AUTOMATA THEORY

Branch: IT
Div.: ALL
Duration: 60 Minutes

Date: 18/10/2024
Timing: 12:00 PM to 01:00 PM
Maximum Marks: 20

Instructions –

1. All questions are compulsory.
2. Assume suitable data wherever necessary and state the assumptions made.
3. Diagrams / sketches should be given wherever necessary.
4. Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5. Figures to the right indicate full marks.

Q.1		Answer any 5 of the following questions	Marks	Course Outcomes	Learning Levels
	a.	Illustrate following properties of Context Free languages. i. Intersection ii. Concatenation	2	4	R
	b.	Find context free grammar generating all string containing a's and b's with atleast one a.	2	4	A
	c.	What is a Pushdown Automaton (PDA) and how does it differ from a Finite Automaton (FA)?	2	5	A
	d.	Describe the transition function of a pushdown automaton (PDA) and its significance in language recognition.	2	5	AN
	e.	Define the term nullable variable in a CFG and give example.	2	4	U
	f.	List down variants of Turing Machine.	2	6	AN
	g.	Explain the basic components and functionality of a Turing Machine.	2	6	R
Q.2	a.	Write left linear grammar and right linear grammar for the language R= (0+1)*00(0+1)*	5	4	AN
		OR			
	b.	Construct a Turing machine to recognize L = {a^n b^n c^n | n>=1}	5	6	C
Q.3	a.	Construct a PDA equivalent to the Context Free Grammar S --> AB A --> aA | b B --> bB | b	5	5	C
		OR			
	b.	Design PDA to recognize L= { a^n b ^2n |n>=1}	5	5	A

THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY
Autonomous College Affiliated to University of Mumbai
Approved by All India Council for Technical Education(AICTE) and Government of Maharashtra(GoM)
Conferred Autonomous Status by University Grants Commission (UGC) for 10 years w.e.f. A.Y 2019-20
Amongst Top 300 Colleges in the Country, Ranked 181st in NIRF India Ranking 2019 in Engineering College category
ISO 9001:2015 Certified • Programmes Accredited by National Board of Accreditation (NBA), New Delhi
Institute Accredited by National Assessment and Accreditation Council (NAAC), Bangalore
Estd. in 2001

IN-SEMESTER EXAMINATION (ISE-III) October, 2024
TE (Semester-V) CBCGS-HME 2023
AUTOMATA THEORY

Branch: Information Technology
Div.: A,B & C
Duration: 60 Minutes
Instructions –

Date: 09/10/2024
Timing: 10:30 AM to 11:30 AM
Maximum Marks: 20

1. All questions are compulsory.
2. Assume suitable data wherever necessary and state the assumptions made.
3. Diagrams / sketches should be given wherever necessary.
4. Use of logarithmic table, drawing instruments and non programmable calculators is permitted.
5. Figures to the right indicate full marks.

Q.1		Solve any 5 Questions.	Marks	CO	Learning Level
	a.	Construct NFA for (11+0)*(00+1)*	02	1	C
	b.	Prove that the language accepted by a DFA is a regular language	02	2	A
	c.	Discuss the closure property of regular languages under intersection and provide an example.	02	3	U
	d.	Which of the following languages is generated by the given grammar? S -->aS | bS | €	02	4	U
	e.	What is a Pushdown Automaton (PDA) and how does it differ from a Finite Automaton (FA)?	02	5	A
	f.	Explain the basic components and functionality of a Turing Machine.	02	6	R
	g.	Demonstrate that Context-Free Grammars encompass Regular Grammars as a subset.	02	4	C
Q.2.	a.	Construct a DFA to check the language that does not contain 'aba' as a substring over ∑={a,b}.	05	1	C
		OR			
	b.	Write a regular expression (RegEx) for given language a) Binary strings containing the sequence 011. b) Binary strings has an even number of 0's and an even number of 1's c) Strings over {a, b} with at most three a s. d) Strings over {a, b, c} in which the fourth symbol from the beginning is a 'c'. e) Binary strings does not contain substring 0110	05	2	A
Q.3	a.	Construct a PDA equivalent to the Context Free Grammar S --> aA|Bb A -->aS|bAA|∈ B --> bS |aBB| ∈	05	3	AN
		OR			
	b.	Construct a turing machine to recognize L = {a^n b^n c^n | n>=1}	05	6	C

THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY
Autonomous College Affiliated to University of Mumbai
Approved by All India Council for Technical Education(AICTE), and Government of Maharashtra(GoM)
Conferred Autonomous Status by University Grants Commission (UGC) for 10 years w.e.f. A.Y 2019-20
Amongst Top 200 Colleges in the Country, Ranked 101st in NIRF India Ranking 2020 in Engineering College category
Est. in 2001

END SEMESTER EXAMINATION, DEC 2024 28 NOV 2024

T.E. SEMESTER V (CBCGS-HME 2023)

Branch:	**IT**	**Q.P. Code:**	**ED245ITR6S3-1**
Subject:	**Automata Theory**	**Duration:**	**2 hours**
Subject Code:	**PCC-IT-502**	**Max. Marks:**	**60**

Instructions: 1. All sections are compulsory
2. Figures to the right indicate full marks.
3. Assume suitable data if necessary and state the assumptions clearly.

Section-I	**Short Answer Questions (Answer any 05 questions out of 06) (Fundamental, Core Types)**				**(10 Marks)**
Q. No.		**Marks**	**CO**	**RBT Level**	**PI**
1	What are the components of a Finite State Machine?	2	1	R	1.2.1
2	Prove that the language accepted by a DFA is a regular language	2	2	A	3.6.1
3	Provide an example of a regular expression representing a language over the alphabet {0, 1} that ends with '01'.	2	3	A	3.6.2
4	What is a Context-Free Grammar (CFG), and how does it differ from a regular grammar?	2	4	R	3.6.1
5	Using an example, explain how a context-free grammar (CFG) can be converted to an equivalent PDA.	2	5	A	2.6.4
6	How does a Turing Machine differ from a finite automaton?	2	6	AN	2.6.4
Section-II	**Descriptive Answer Questions (Answer any 04 out of 06) (Descriptive, Comprehension Types)**				**(20 Marks)**
1	Construct a mealy machine accepting strings, having substrings either 'aba' or 'bab' over $\sum$={a,b}.	5	1	A	2.6.3
2	Design a ϵ-NFA for the following regular expression (0+1)*0(0+1)(0+1)	5	2	A	2.6.3
3	Apply the Pumping Lemma to prove that the language L = {0^n 1^n | n >0} is not regular	5	3	AN	1.2.1
4	Find a leftmost derivation and a rightmost derivation with corresponding parse trees for strings "aaabbabbba" using the following CFG, S → aB / bA A → aS / bAA / a B → bS / aBB / b	5	4	A	2.5.2
5	Construct a PDA equivalent to the Context Free Grammar S --> AB A --> aA | b B --> bB | b	5	5	A	2.6.3

6	Illustrate difference between a deterministic and a nondeterministic Turing machine.	5	6	U	2.6.4
Section-III	**Long Answer Question (Answer any 03 out of 05) (Application, Analytical, Evaluation, Design Type)**				**(30 Marks)**
1	Convert NFA ({P,Q,R,S},d, P,{S}) to its equivalent Minimized DFA where d is given by following figure.	10	2	AN	2.6.3
2	Apply the Pumping Lemma to prove following languages are regular or not i) L = {a^n b^n | n is square} ii) L =w ∈ {a, b}* | w has an equal number of a's and b's	10	3	AN	1.2.1
3	i) Show that the following grammars are ambiguous or not? if ambiguous then remove it and rewrite the grammar. S -> aSb| AB A-> cA|∈ B-> dB|∈ ii) Simplify the following context free grammar S--> aAbB | ba A --> aA | ∈ B --> bB | ∈	10	4	AN	3.6.1
4	Design PDA to recognize Language, L= {WcW ^R }|W∈{a,b}* c is any terminal?	10	5	A	2.6.3
5	Construct Turing Machine for the following a) r = (ba+ab)(a+b)* b) To accept the language L={a ^n b^2n }| n>=1 }	10	6	A	2.6.3

Q\Σ	0	1
P	P,Q	P
Q	R	R
R	S	-
S	S	S