



**Sri Indu Institute of  
Engineering & Technology**

Recognized Under 2(f) of UGC Act 1956

Approved by AICTE, New Delhi

Affiliated to JNTUH, Hyderabad.

# **COURSE FILE**

**ON**

## **FORMAL LANGUAGE AND AUTOMATA THEORY**

**Course Code - CS501PC  
III B.Tech I-SEMESTER**

**A.Y.: 2022-2023**

**Prepared by**

**Mrs.R.SRAVANTHI  
Assistant Professor**

*B. Retha Kaul*  
Computer Science & Engg. Dept.  
SRI INDU INSTITUTE OF ENGG & TECH.  
Sheriguda(V), Ibrahimpatnam(M), R.R.Dist-501 1C.

  
**PRINCIPAL**  
Sri Indu Institute of Engineering & Techn.  
Sheriguda(Vill), Ibrahimpatnam  
R.R. Dist. Telangana-501 510.



## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

<b>Academic Year</b>	2022-2023
<b>Course Title</b>	FORMAL LANGUAGE AND AUTOMATA THEORY
<b>Course Code</b>	CS501PC
<b>Programme</b>	B.Tech
<b>Year &amp; Semester</b>	III year I-semester
<b>Branch &amp; Section</b>	CSE-B
<b>Regulation</b>	R18
<b>Course Faculty</b>	Mrs. R.SRAVANTHI, Assistant Professor

### Index of Course File

S. No.	Name of the content
1	Institute vision and mission
2	Department vision and mission /PEO
3	POs /PSOs
4	Course Syllabus with Structure
5	Course Outcomes (CO)
6	Mapping CO with PO/PSO; Course with PO/PSO with Justification
7	Academic Calendar
8	Time table - highlighting your course periods including tutorial
9	Lesson plan with number of hours/periods, TA/TM, Text/Reference book
10	Web references
11	Lecture notes
12	List of Power point presentations / Videos
13	University Question papers
14	Internal Question papers, Key with CO and BT
15	Assignment Question papers mapped with CO and BT
16	Result Analysis to identify weak and advanced learners - 3 times in a semester
17	Result Analysis at the end of the course
18	Remedial class for weak students - schedule and evidences
19	Advance Learners- Engagement documentation
20	CO, PO/PSO attainment sheets
21	Attendance register (Theory/Tutorial/Remedial) - Teacher/Course delivery record; Continuous evaluation
22	Course file (Digital form)



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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

### INSTITUTE VISION AND MISSION

#### Vision:

To become a premier institute of academic excellence by providing the world class education that transforms individuals into high intellectuals, by evolving them as empathetic and responsible citizens through continuous improvement.

#### Mission:

**IM1:** To offer outcome-based education and enhancement of technical and practical skills.

**IM2:** To continuously assess of teaching-learning process through institute-industry collaboration..

**IM3:** To be a centre of excellence for innovative and emerging fields in technology development with state-of-art facilities to faculty and students fraternity.

**IM4:** To create an enterprising environment to ensure culture, ethics and social responsibility among the stakeholders

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Campus Ph: 9640590999, 9347187999, 8096951507.



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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

### DEPARTMENT VISION AND MISSION


#### Vision:

To become a prominent knowledge hub for learners, strive for educational excellence with innovative and industrial techniques so as to meet the global needs.

#### Mission:

- DM1 :** To provide ambience that enhances innovations, problem solving skills, leadership qualities, decision making, team-spirit and ethical responsibilities.
- DM2 :** To impart quality education with professional and personal ethics, so as to meet the challenging technological needs of the industry and society.
- DM3 :** To provide academic infrastructure and develop linkage with the world class organizations to strengthen industry-academia relationships for learners.
- DM4 :** To provide and strengthen new concepts of research in the thrust area of Computer Science and Engineering to reach the needs of Government and Society.

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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

### PROGRAM EDUCATIONAL OBJECTIVES

- PEO1:** To develop trained graduates with strong academic and technical skills of modern computer science and engineering.
- PEO2:** To promote trained graduates with leadership qualities and the ability to solve real time problems using current techniques and tools in interdisciplinary environment.
- PEO3:** To motivate the graduates towards lifelong learning through continuing education and professional development.

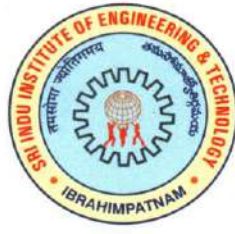
### PROGRAM SPECIFIC OUTCOMES

- PSO1 : Professional Skills:** To implement computer programs of varying complexity in the areas related to Web Design, Cloud Computing, Network Security and Artificial Intelligence.
- PSO2: Problem-Solving Skills:** To develop quality products using open ended programming environment.

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## PROGRAMME OUTCOMES (POs)

- PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2: Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO9: Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY  
HYDERABADB.Tech. in COMPUTER SCIENCE AND  
ENGINEERING  
COURSE STRUCTURE & SYLLABUS (R18)**

**Applicable From 2018-19 Admitted Batch**

**III YEAR I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS501PC	Formal Languages & Automata Theory	3	0	0	3
2	CS502PC	Software Engineering	3	0	0	3
3	CS503PC	Computer Networks	3	0	0	3
4	CS504PC	Web Technologies	3	0	0	3
5		Professional Elective-I	3	0	0	3
6		Professional Elective -II	3	0	0	3
7	CS505PC	Software Engineering Lab	0	0	3	1.5
8	CS506PC	Computer Networks & Web Technologies Lab	0	0	3	1.5
9	EN508HS	Advanced Communication Skills Lab	0	0	2	1
10	*MC510	Intellectual Property Rights	3	0	0	0
<b>Total Credits</b>			<b>21</b>	<b>0</b>	<b>8</b>	<b>22</b>

**III YEAR II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS601PC	Machine Learning	3	1	0	4
2	CS602PC	Compiler Design	3	1	0	4
3	CS603PC	Design and Analysis of Algorithms	3	1	0	4
4		Professional Elective – III	3	0	0	3
5		Open Elective-I	3	0	0	3
6	CS604PC	Machine Learning Lab	0	0	3	1.5
7	CS605PC	Compiler Design Lab	0	0	3	1.5
8		Professional Elective-III Lab	0	0	2	1
9	*MC609	Environmental Science	3	0	0	0
<b>Total Credits</b>			<b>18</b>	<b>3</b>	<b>8</b>	<b>22</b>

**MC - Environmental Science – Should be Registered by Lateral Entry Students Only**

**\*MC – Satisfactory/Unsatisfactory**

**Note:** Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

**Professional Elective - I**

CS511PE	Information Theory & Coding
CS512PE	Advanced Computer Architecture
CS513PE	Data Analytics
CS514PE	Image Processing
CS515PE	Principles of Programming Languages

**Professional Elective - II**

CS521PE	Computer Graphics
CS522PE	Advanced Operating Systems
CS523PE	Informational Retrieval Systems
CS524PE	Distributed Databases
CS525PE	Natural Language Processing

**Professional Elective - III**

CS611PE	Concurrent Programming
CS612PE	Network Programming
CS613PE	Scripting Languages
CS614PE	Mobile Application Development
CS615PE	Software Testing Methodologies



## CS501PC: FORMAL LANGUAGES AND AUTOMATA THEORY

III Year B.Tech. CSE I-Sem

L T P C

3 0 0 3

### Course Objectives

- To provide introduction to some of the central ideas of theoretical computer science from the perspective of formal languages.
- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- Classify machines by their power to recognize languages.
- Employ finite state machines to solve problems in computing.
- To understand deterministic and non-deterministic machines.
- To understand the differences between decidability and undecidability.

### Course Outcomes

- Able to understand the concept of abstract machines and their power to recognize the languages.
- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undecidability.
- Able to gain proficiency with mathematical tools and formal methods.

### UNIT - I

**Introduction to Finite Automata:** Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

**Nondeterministic Finite Automata:** Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

**Deterministic Finite Automata:** Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with  $\epsilon$ -transitions to NFA without  $\epsilon$ -transitions. Conversion of NFA to DFA, Moore and Melay machines

### UNIT - II

**Regular Expressions:** Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

**Pumping Lemma for Regular Languages,** Statement of the pumping lemma, Applications of the Pumping Lemma.

**Closure Properties of Regular Languages:** Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata

### UNIT - III

**Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

**Push Down Automata:** Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack,

Deterministic Pushdown Automata. From CFG to PDA, From PDA to CFG.

#### **UNIT - IV**

**Normal Forms for Context-Free Grammars:** Eliminating useless symbols, Eliminating  $\epsilon$ -Productions. Chomsky Normal form Griebach Normal form.

**Pumping Lemma for Context-Free Languages:** Statement of pumping lemma, Applications

#### **UNIT - V**

**Types of Turing machine:** Turing machines and halting

**Undecidability:** Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines.

#### **TEXT BOOKS:**

1. Introduction to Automata Theory, Languages, and Computation, 3<sup>rd</sup> Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekar, 2nd edition, PHI.

#### **REFERENCE BOOKS:**

1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3<sup>rd</sup> edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.





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## Department of Computer Science and Engineering 2022- 2023; 1<sup>st</sup> Semester

### CO – PO / PSO Mapping Justification

**Course: Formal Languages and Automata Theory**

**(CS501PC) Class: III – I SEM – B**

#### **PROGRAMME OUTCOMES (POs):**

- PO1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO2 Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO3 Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

#### **PROGRAM SPECIFIC OUTCOMES (PSOs):**

**PSO1 Professional Skills:** The ability to implement computer programs of varying complexity in the areas related to web design, cloud computing and networking.

**C311.1** Design finite automata without output like DFA, NFA,  $\epsilon$ -NFA and finite automata

With Output like Moore and mealy machines and also conversions among them like (NFA to DFA). (Synthesis)

	<b>Justification</b>
<b>PO1</b>	Gain knowledge on finite automata.(level 2)
<b>PO2</b>	Analyse problem and accordingly construct finite automata.(level 1)
<b>PO3</b>	Design solutions for engineering problems and design system components using finite automata.(level 2)

**C311.2** Recognize about regular expressions, pumping lemma for regular languages and Closure properties of regular languages. (Knowledge)

	<b>Justification</b>
<b>PO1</b>	Gain knowledge on regular expressions. (level 2)
<b>PO3</b>	Use regular expressions concept in pattern matching. (level 1)
<b>PO5</b>	To create lex programs use regular expressions. (level 1)
<b>PSO1</b>	In Web designing, for text searching use regular expressions. (level 2)

**C311.3** Define CFG, derivations (Leftmost &Rightmost) and draw parse trees and gain Knowledge on Ambiguity in Grammars. (Knowledge)

	<b>Justification</b>
<b>PO1</b>	Gain knowledge on CFG,derivations and parse trees(level 2)
<b>PO2</b>	Analyse problem and accordingly construct CFG. (level 1)
<b>PO3</b>	Use CFG in design of parsers in compiler design and XML. (level 2)
<b>PO5</b>	To create YACC (parsers) use CFG. (level 1)
<b>PSO1</b>	In compiler design (Parsers), web designing (XML, DTD) use CFG. (level 2)

**C311.4** Define and design a PDA for a given CFL. Prove the equivalence of CFG and PDA and their inter-conversions. (Knowledge).

	<b>Justification</b>
<b>PO1</b>	Gain knowledge on pushdown automata(level 2)

**C311.5** Illustrate CFG normal forms, Use pumping lemma to prove that a language is not a CFL and Define and design TM for a given computation. (Comprehension)

	<b>Justification</b>
<b>PO1</b>	Gain knowledge on CFG normal forms and Turing machines. (level 2)
<b>PO2</b>	Analyse problem and accordingly construct Turing machine(level 1)
<b>PO3</b>	Design solutions for engineering problems using Turing machine(level 2)

**C311.6** Differentiate between decidability and undesirability, Generalize Turing

Machines into universal TMs (Analysis)

	<b>Justification</b>
<b>PO1</b>	Gain knowledge on decidability ,undecidability, universal TM and post correspondence problem(level 2)
<b>PO2</b>	Analyse problem and solve it. (level 1)

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**ACADEMIC CALENDAR 2022-23**

**B. Tech./B. Pharm. III YEAR I & II SEMESTERS**

**I SEM**

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	09.09.2022	
2	1 <sup>st</sup> Spell of Instructions (including Dussehra Recess)	09.09.2022	10.11.2022 (9 Weeks)
3	Dussehra Recess	03.10.2022	08.10.2022 (1 Week)
4	First Mid Term Examinations	11.11.2022	17.11.2022 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	24.11.2022	
6	2 <sup>nd</sup> Spell of Instructions	18.11.2022	12.01.2023 (8 Weeks)
7	Second Mid Term Examinations	16.01.2023	21.01.2023 (1 Week)
8	Preparation Holidays and Practical Examinations	23.01.2023	28.01.2023 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	30.01.2023	
10	End Semester Examinations	30.01.2023	11.02.2023 (2 Weeks)

Note: No. of Working/ instructional days: 92

**II SEM**

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	13.02.2023	
2	1 <sup>st</sup> Spell of Instructions	13.02.2023	08.04.2023 (8 Weeks)
3	First Mid Term Examinations	10.04.2023	15.04.2023 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	22.04.2023	
5	2 <sup>nd</sup> Spell of Instructions (including Summer Vacation)	17.04.2023	24.06.2023 (10 Weeks)
6	<b>Summer Vacation</b>	15.05.2023	27.05.2023 (2 Weeks)
7	Second Mid Term Examinations	26.06.2023	01.07.2023 (1 Week)
8	Preparation Holidays and Practical Examinations	03.07.2023	08.07.2023 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	08.07.2023	
10	End Semester Examinations	10.07.2023	22.07.2023 (2 Weeks)

Note: No. of Working/ instructional days: 90

  
REGISTRAR



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### TIME TABLE FOR A.Y 2022-23

Class: III-B. Tech CSE -A

Semester: I

LH. NO: A-201

W.E.F:09-09-2022

Period/ Day	1	2	3	4	1:00- 1:30	5	6	7
	9:40-10:30	10:30-11:20	11:20-12:10	12:10-1:00		1:30-2:20	2:20-3:10	3:10-4:00
Monday	WT	CN&WT LAB(BATCH-I)/ACS LAB(BATCH-II)			L U N C H	SE	CO-C/SS/DAA	
Tuesday	DDB	PPL	WT	LIB		FLAT	SE	IPR
Wednesday	PPL	COUN	DDB	CN		ACS LAB(BATCH-I) /SE LAB(BATCH-II)		
Thursday	SE	PPL	CN	FLAT		WT	IPR	SPORTS
Friday	CN	SE	FLAT	DDB		PPL	WT	IPR
Saturday	FLAT	CN	WT			CN&WT LAB(BATCH-II)/SE LAB(BATCH-I)		

(T) – Tutorial (concern faculty)

Subject Code	Subject Name	Name of the Faculty	Subject Code	Subject Name	Name of the Faculty
CS501PC	Formal Language & Automata Theory	Mrs.R.Sravanthi	EN508HS	Advanced Communication Skills Lab	Mrs E Prarthana
CS502PC	Software Engineering	Mrs P Sowjanya	MC510	Intellectual Property Rights	Mr Sannala Srinivas
CS503PC	Computer Networks	Dr. Bapathu Gangadhara Obula Reddy		CO-C/SS/DAA/Fundamentals of AI	Mrs.R.Sravanthi
CS504PC	Web Technologies	Mrs.M Sruthi	Sports	Sports	Mr.K.Veera Kishore
CS505PC	Software Engineering Lab	Mrs P Sowjanya / Mrs.R.Sravanthi/ Mr. Jalli Anandarao	Internet	Internet	Mrs P Sowjanya
CS506PC	Computer Networks & Web Technologies Lab	Dr. Bapathu Gangadhara Obula Reddy / Mrs.M.Sruthi	LIB	Library	Mrs.M Sruthi
CS515PE	Principal of Programming languages	Mrs.E.Rupa	COUN	Counselling	Mrs. A.Sudha
CS524PE	Distributed Databases	Mrs.A.Sudha	CS504PC	Web Technologies	Mr M Dattatreya Goud(Adjunct)
Class In-Charge : Mrs P Sowjanya		Mentor 1 : Mrs P Sowjanya	Mentor 2: Mrs.M Sruthi		

Class In-Charge

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Website: <https://siiet.ac.in/>

Course Title	Formal Languages and Automata Theory
Course Code	CS501PC
Programme	B.Tech
Year & Semester	III year I-semester, B sec
Regulation	R18
Course Faculty	Mrs. R.Sravanthi ,Assistant Professor , CSE

## LESSON PLAN

S.NO	Unit	Topic	Number of Sessions Planned	Teaching Method/Aids	Reference
1.	<b>1</b>	Structural Representations	1	Black Board	T1
2.		Automata and Complexity, Alphabets, Strings	1	Black Board	T1
3.		Languages, Problems	1	Black Board	T1
4.		<b>Deterministic Finite Automata:</b> Definition of DFA	1	Black Board	T1
5.		Conversion of NFA with $\epsilon$ -transitions to NFA without $\epsilon$ -transitions	2	Black Board	T1
6.		Conversion of NFA to DFA	2	Black Board	T1

7.		Moore and Mealy machine	2	Black Board	T1
8.	2	Finite Automata and Regular Expressions	2	Black Board	T1
9.		Applications of Regular Expressions	1	Black Board	T1
10.		Algebraic Laws for Regular Expressions	1	Black Board	T1
11.		Conversion of Finite Automata to Regular Expressions	3	Black Board	T1
12.		Statement of the pumping lemma	1	Black Board	T1
13.		Applications of the Pumping Lemma	2	Black Board	T1
14.		Closure properties of Regular languages, Decision Properties of Regular Languages	1	Black Board	T1
15.		Equivalence and Minimization of Automata.	4	Black Board	T1
16.		3	Definition of Context-Free Grammars	1	Black Board
17.	Derivations Using a Grammar		1	Black Board	T1
18.	Leftmost and Rightmost Derivations		1	Black Board	T1
19.	the Language of a Grammar		1	Black Board	T1
20.	Sentential Forms, Parse Trees		1	Black Board	T1
21.	Applications of Context-Free Grammars, Ambiguity in Grammars and Languages		1	Black Board	T1
22.	Definition of the Pushdown Automaton		1	Black Board	T1
23.	The Languages of a PDA		1	Black Board	T1
24.	Equivalence of PDA's and CFG's		1	Black Board	T1
25.	Acceptance by final state, Acceptance by empty stack		1	Black Board	T1
26.	Deterministic Pushdown Automata, From CFG to PDA		1	Black Board	T1
27.	From PDA to CFG	1	Black Board	T1	
28.		Eliminating useless mbols, Eliminating $\epsilon$ -Productions	1	Black Board	T1
29.		Chomsky Normal form	1	Black Board	T1
30.		Griebach Normal form	1	Black Board	T1

31.	4	Statement of pumping lemma	1	Black Board	T1
32.		Applications , Closure properties of CFL's, Decision Properties of CFL's	1	Black Board	
33.		Introduction to Turing Machine	1	Black Board	T1
34.		Formal Description, Instantaneous description	1	Black Board	T1
35.		The language of a Turingmachine	1	Black Board	T1
36.	5	Turing machines and halting	1	Black Board	T1
37.		Undecidability	1	Black Board	T1
38.		A Language that is Not Recursively Enumerable	1	Black Board	T1
39.		An Undecidable Problem That is RE	1	Black Board	T1
40.		Undecidable Problems about Turing Machines	1	Black Board	T1
41.		Recursive languages, Properties of recursive languages	1	Black Board	T1
42.		Post's Correspondence Problem	1	Black Board	T1
43.		Modified Post Correspondence problem	1	Black Board	T1
44.		Other Undecidable Problems, Counter machines	1	Black Board	T1

### TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3<sup>rd</sup> Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekar, 2nd edition, PHI.

### REFERENCE BOOKS:

1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3<sup>rd</sup> edition, Cengage Learning.
5. Introduction to Formal Languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.



# SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Accredited by NAAC with A+ Grade, Recognized under 2(f) of UGC Act 1956

(Approved by AICTE, New Delhi and Affiliated to JNTUH, Hyderabad)

Khalsa Ibrahimpatnam, Sheriguda (V), Ibrahimpatnam (M), Ranga Reddy Dist., Telangana – 501 510

Website: <https://siiet.ac.in/>

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## Lecture notes

### Unit 1 link:

[https://drive.google.com/file/d/1EuUkhWu127k1aw0VfFJJGPjnF5o57bMb/view?usp=drive\\_link](https://drive.google.com/file/d/1EuUkhWu127k1aw0VfFJJGPjnF5o57bMb/view?usp=drive_link)

### Unit 2 link:

[https://drive.google.com/file/d/1-5IdtcZxkTGiorjDK22rQWrrWvCDPxyz/view?usp=drive\\_link](https://drive.google.com/file/d/1-5IdtcZxkTGiorjDK22rQWrrWvCDPxyz/view?usp=drive_link)

### Unit 3 link:

[https://drive.google.com/file/d/1hWbA29Qb1XPfZiWW0lmUkUPABPxve1up/view?usp=drive\\_link](https://drive.google.com/file/d/1hWbA29Qb1XPfZiWW0lmUkUPABPxve1up/view?usp=drive_link)

### Unit 4 link:

[https://drive.google.com/file/d/1ytrJ7Nq\\_KQ\\_juPZ7dLuOeiiuZNIv\\_jdZ/view?usp=sharing](https://drive.google.com/file/d/1ytrJ7Nq_KQ_juPZ7dLuOeiiuZNIv_jdZ/view?usp=sharing)

### Unit 5 link:

<https://drive.google.com/file/d/17osAW-8Qug3K24B1GDn-AOD90FXnNZSc/view?usp=sharing>

## List of Powerpoint presentations

### Unit-1

<https://docs.google.com/presentation/d/1CwEOXxOJzkxLgvG4KnDzTTTdaHTjDGYp/edit?usp=sharing&oid=101934197796008722334&rtpof=true&sd=true>

### unit-2

[https://docs.google.com/presentation/d/1mQ\\_0tHIAxtniEahVO8kEGW9mgoLv-Uy8/edit?usp=sharing&oid=101934197796008722334&rtpof=true&sd=true](https://docs.google.com/presentation/d/1mQ_0tHIAxtniEahVO8kEGW9mgoLv-Uy8/edit?usp=sharing&oid=101934197796008722334&rtpof=true&sd=true)

### unit-3

[https://docs.google.com/presentation/d/1-kMUneg01J\\_79UHF5yZu575Ycczc9zW2/edit?usp=sharing&oid=101934197796008722334&rtpof=true&sd=true](https://docs.google.com/presentation/d/1-kMUneg01J_79UHF5yZu575Ycczc9zW2/edit?usp=sharing&oid=101934197796008722334&rtpof=true&sd=true)

CodeNo:155BK

R18

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD  
B.TechIIIYearISemesterExaminations,August-2022  
FORMALLANGUAGESANDAUTOMATATHEORY  
(Common to CSE,IT,ITE)

Time:3Hours

Max.Marks: 75

Answer any five questions  
All questions carry equal marks

---

- 1) Differentiate between NFA and DFA.
- b) Construct DFA for the following language:
  - i)  $L = \{w \mid w \text{ has both an even number of } 0\text{'s and an even number of } 1\text{'s}\}$
  - ii)  $L = \{w \mid w \text{ is in the form of } x0^i1^j \text{ for some strings } x \text{ and } y \text{ consisting of } 0\text{'s and } 1\text{'s}\}$ .

[5+10]

- 2) Design a Moore Machine to determine the residue mod 3,

Where input is treated as binary.

- b) Construct the NFA accepting the following language:
  - i) The set of all strings over  $\Sigma = \{a, b\}$  starting with the prefix "ab"
  - ii) The set of all strings over  $\{0, 1\}$  except those containing the substring "001".

[7+8]

- 3) Construct the NFA for the regular expression  $r = ((01+10)^*00)^*$ .

- a) What are the closure properties of regular languages?
- b) State the Pumping Lemma for regular sets.

[6+5+4]

- 4) Construct the regular expression for the language over the set  $S = \{0, 1\}$

- i) The set of all strings containing no three consecutive 0's.
- ii) The set of all strings in which the number of occurrences is divisible by 3.

Design NFA with epsilon for the RE  $= (a/b)^*ab$  and convert it into DFA and further find the minimized DFA.

[6+9]

5.a) What do you mean by ambiguity in grammars and languages? How to eliminate ambiguity in grammars? Explain with an example.

- a) Consider the grammar  $(\{S, A, B\}, \{a, b\}, P, S)$  that has the productions:  $S \rightarrow bA \mid aB$

$A \rightarrow bAA \mid aS \mid aB \rightarrow aBB \mid bS \mid b$ .

- b) Find an equivalent grammar in CNF.

[7+8]

- 6) Construct the PDA for the following grammar:

a)  $S \rightarrow aAA, A \rightarrow aS|bS|a$

b) Discuss the applications of Push down Automata. [8+7]

7) Explain the importance of Turing Machines and also give descriptions of various types of Turing Machines with necessary examples. [15]

8) Discuss briefly about decidability and undecidability problems. [15]

---oo0oo---

CodeNo:155BK

**JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD**

**B.TechIIIYearISemesterExaminations,September-2021**

**FORMAL LANGUAGES AND AUTOMATA THEORY**

(Common to CSE,IT)

**Time:3Hours**

**Max.Marks: 75**

**Answer any five questions  
All questions carry equal marks**

----

1.a) Convert the following NFA to DFA

State	a	b
Q <sub>0</sub>	Q <sub>0</sub>	Q <sub>1</sub>
Q <sub>1</sub>	Q <sub>0</sub>	{Q <sub>0</sub> ,Q <sub>1</sub> }
Q <sub>2</sub>	Q <sub>0</sub>	Q <sub>3</sub>
Q <sub>3</sub> *	Q <sub>0</sub>	---

b) Construct a DFA to accept the binary strings consisting of even number of 0's and odd number of 1's. [8+7]

2.a) Construct a DFA to accept the binary strings divisible by 5.

b) Eliminate the  $\epsilon$ -transitions of the following NFA. [7+8]

State	a	b	$\epsilon$
Q <sub>0</sub>	Q <sub>0</sub>	Q <sub>1</sub>	Q <sub>2</sub>
Q <sub>1</sub>	Q <sub>1</sub>	Q <sub>2</sub>	Q <sub>3</sub>
Q <sub>2</sub>	Q <sub>2</sub>	Q <sub>3</sub>	
Q <sub>3</sub> *	Q <sub>0</sub>	---	

3.a) Prove that Regular Languages are closed under i) Reverse ii) Union.

b) Identify the regular expression accepted by the following DFA. [7+8]

State	a	b
Q <sub>0</sub>	Q <sub>2</sub>	Q <sub>1</sub>
Q <sub>1</sub>	Q <sub>3</sub>	Q <sub>2</sub>
Q <sub>2</sub>	Q <sub>0</sub>	Q <sub>3</sub>
Q <sub>3</sub> *	--	---

4.a) Prove that  $L = \{ WW^r \mid W \text{ is a binary string} \}$  is not regular language.

b) Construct a DFA accepting language represented by  $(0+1)^*(00+11)(0+1)^*$ . [7+8]

5.a) Construct a PDA to accept the binary strings consist of number of 0's not equal to number of 1's.

b) Construct a PDA to accept the language generated by the following CFG. [7+8]

$S \rightarrow Aab$   
 $A \rightarrow Aab|b$

6.a) Construct a PDA to accept the following language  $L = \{ a^n b^n \mid n > 0 \}$ .

b) Construct a CFG to generate the binary strings consisting the number of 0's is equal to the twice the number of 1's. [8+7]

ex: 010,001010

7) Convert the following grammar into CNF.

$S \rightarrow aSa|bSb|a|b|aa|bb$

b) Simplify the following CFG  $S \rightarrow aA|aBB$

$A \rightarrow Aa| \epsilon$   $B \rightarrow bB|bbC$

$C \rightarrow b$

[8+7]

8 a) Construct Turing Machine to accept following language and give its state Transition table and diagram.  
Check the machine by tracing a suitable instance.

$L = \{a^n b^n c^n | n \geq 1\}$ .

b) Design a TM which subtracts two unary numbers. i.e  $m-n$  where  $m \geq n$ .

[7+8]

---ooOoo---



**CodeNo:155BK****JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD****B.TechIIIYearISemesterExaminations, August-2022  
FORMALLANGUAGESANDAUTOMATATHEORY  
(Common to CSE, IT, ITE)****Time:3Hours****Max.Marks: 75****Answer any five questions  
All questions carry equal marks**

---

1 a) Differentiate between NFA and DFA.

b) Construct DFA for the following language:

i)  $L = \{w \mid w \text{ has both an even number of } 0\text{'s and an even number of } 1\text{'s}\}$ ii)  $L = \{w \mid w \text{ is in the form of } x0^i y \text{ for some strings } x \text{ and } y \text{ consisting of } 0\text{'s and } 1\text{'s}\}$ .

[5+10]

2 a) Design a Moore Machine to determine the residue mod 3, where input is treated as binary.

b) Construct the NFA accepting the following language:

i) The set of all strings over  $\Sigma = \{a, b\}$  starting with the prefix "ab"ii) The set of all strings over  $\{0, 1\}$  except those containing the substring "001". [7+8]3 a) Construct the NFA for the regular expression  $r = ((01+10)^*00)^*$ .

b) What are the closure properties of regular languages?

c) State the Pumping Lemma for regular sets. [6+5+4]

4) Construct the regular expression for the language over the set  $S = \{0, 1\}$ 

i) The set of all strings containing no three consecutive 0's.

ii) The set of all strings in which the number of occurrences is divisible by 3.

5) Design NFA with epsilon for the RE  $= (a/b)^*ab$  and convert it into DFA and further find the minimized DFA. [6+9]

6) What do you mean by ambiguity in grammars and languages? How to eliminate ambiguity in grammars?

a) Consider the grammar  $(\{S, A, B\}, \{a, b\}, P, S)$  that has the productions:  $S \rightarrow bA \mid aB$   $A \rightarrow bAA \mid aS \mid a$   
 $B \rightarrow aBB \mid bS \mid b$ .

b) Find an equivalent grammar in CNF. [7+8]

7) Construct the PDA for the following grammar:

 $S \rightarrow aAA, \quad A \rightarrow aS \mid bS \mid a$ 

b) Discuss the applications of Push down Automata. [8+7]

8) Explain the importance of Turing Machines and also give descriptions of various types of Turing Machines with necessary examples. [15]

9) Discuss briefly about decidability and undecidability problems. [15]

---oo0oo---

**Sri Indu Institute of Engineering & Technology**  
Sheriguda (V), Ibrahimpatanam (M), R.R.Dist-501 510  
**I- Mid Examinations, Nov-2022**

Set – I

Year & Branch: **III Year I Sem (A,B,C)**

Date: 14-11-2022 (FN)

Subject: – FLAT

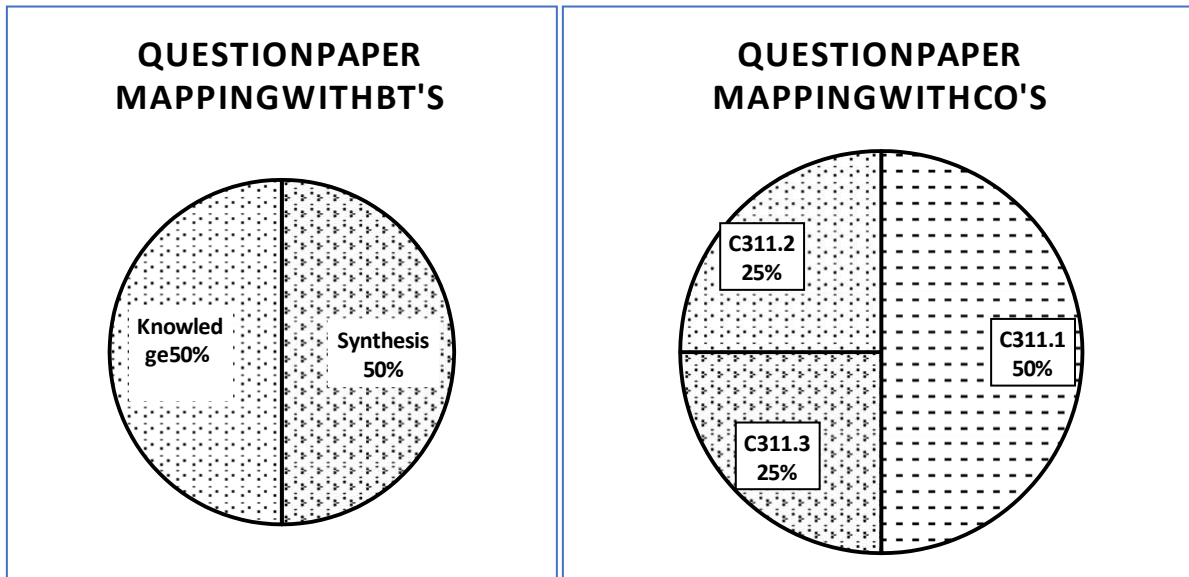
.Marks:10 Times: 60 min

Answer any **TWO** Questions. All Question Carry Equal Marks

2\*5=10 marks

(This question paper is prepared with Course Outcome and BT's mapping)

- |   |  |             |              |
|---|--|-------------|--------------|
| 1 | Explain transition diagram, transition table with example.     | (5)(C311.1) | ( Synthesis) |
| 2 | Write any four differences between DFA and NFA Apply           | (5)(C311.1) | ( Knowledge) |
| 3 | Write the applications of pumping lemma for regular languages. | (5)(C311.2) | (Knowledge ) |
| 4 | Convert Moore machine to Mealy machine with an example.        | (5)(C311.1) | (Synthesis)  |



# SriInduInstituteofEngineering&Technology

Sheriguda(V),Ibrahimpattanam(M),R.R.Dist-501510

I- MidExaminations,Nov-2022

Set-II

Year&Branch:III-CSE(A,B,C)

Date: 14-11-2022 (FN)

Subject:FLAT

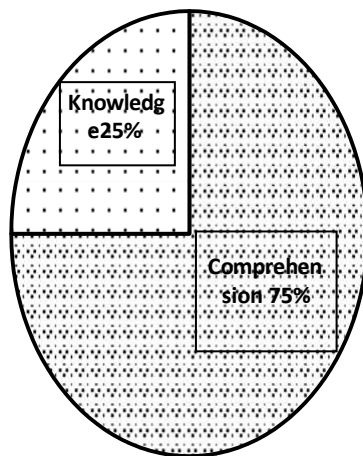
Marks: 10

Time:60min

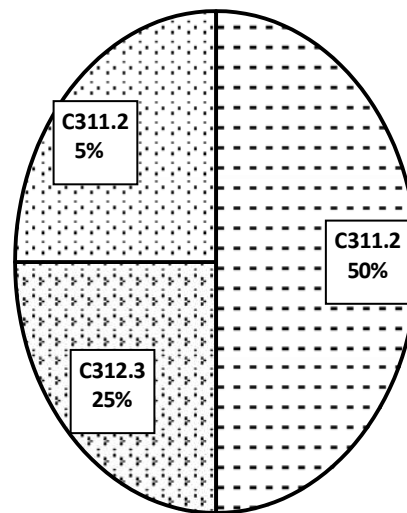
**Answer any TWO Questions. All Questions Carry Equal Marks 2\*5=10marks**

- 1 Define language over an alphabet with examples 5(C311.1)(Comprehension)
- 2 Construct NFA which accepts string start with 0 or 1 and end with 01 or 10 and Write the mathematical definition of NFA. 5(C311.1)( Comprehension)
- 3 Convert given Finite Automata to Regular Expression using Arden's theorem. (5)(C311.2)(Comprehension)
- 4 Define Identity rules . Give an example using the identity rules for the simplification. (5)(C311.3)(Knowledge)

## QUESTIONPAPER MAPPING WITHBT'S



## QUESTIONPAPER MAPPINGWITHCO'S



# Sri Indu Institute of Engineering & Technology

Shereguda (V), Ibrahimpatnam (M), R.R.Dist-501 510

**B-Tech III Year I sem - Mid Examinations, Nov-**

**2022 Objective Type Exam**

Year & Branch: **III Year I Sem**

Date: 14-11-2022

Subject: **FLAT**

Max. Marks: 10

Time: 20 mins

Name: ..... Roll No.....

---

**Choose the correct answers.**

1. DFA full form. [ ]

A) Determine finite automata B) Deterministic finite au

C) Define finited automata D) Define finite automata

2. Symbole is represented by [ ]

A)  $\Omega$  B)  $\epsilon$

C)  $\Sigma$  D)  $\beta$

[ ]

3. Automata can be defined by using

B) 4 B) 7

C) 5 D) NONE

4. A healy in acline is a tuple [ ]

A) 4 B) 5 C) 6 D) 7

5 Machine the output dependson only present state [ ]

A) Mealy B) Mooi'e

C) NFA D) None

6. DFA has

infinitely many state but finitely

manyaccept states.

finitely many states.

A. transition function with finite domain and range.

B. transition function with possibly infinite range or domain

a) Only A and B

b) Only B and C c) Only A ,B, and C d) All

7.Regular languages are closed over

- a)concatenation b)union c)intersection d)complement
- e)All of above

8.If  $\Sigma = \{0,1\}$ , then  $\Phi^*$  will result to:

- a)  $\epsilon$  b)  $\epsilon$  c)  $\Sigma$  d)None of the mentioned

9.Automata can be defined by using

- a)4 tuples b)5 tuples c)3 tuples d)2 tuples

10. Which of the following is not a part of definition of finite automata.

- a)Input alphabet b)Transition function c)Initial State d)Output Alphabet

**Fill In The Blanks:**

1.RR\* can be expressed in which of the Forms \_\_\_\_\_

2.The minimum number of states required in a DFA (along with a dumping state) to check whether the 3rd bit is 1 or not for  $|n| \geq 3$  over  $(0,1)$  \_\_\_\_\_

3. $\epsilon$  (1+ $\epsilon$ ) represents \_\_\_\_\_

4.The logic of pumping lemma is good example of \_\_\_\_\_

5. $\epsilon$ R is equivalent to \_\_\_\_\_

6.L = { $\epsilon$ , a,,aa,aaa,.....} is represented by \_\_\_\_\_

7. $\epsilon$ -closure of a state is combination of self-state and

8.P, O, R be regular expression over  $\Sigma$ , P is not  $\epsilon$ , then  $R=Q + RP$  has a unique solution: \_\_\_\_\_

9.Arden's theorem is true for: \_\_\_\_\_

10.Regular expression equivalent to language accepted by DFA can be determined by \_\_\_\_\_

# SriInduInstituteofEngineering&Technology

Sheriguda(V),Ibrahimpnam(M),R.R.Dist-501 510

II- MidExaminations,JAN-2023

Set-I

Year&Branch:III-CSE(A,B,C)

Date: 21-1-2023 (FN)

Subject: FLAT

Marks:10

Time:60min

Answer any **TWO** Questions. All Question Carry Equal Marks 2\*5=10 marks

(This question paper is prepared with Course Outcome and BT's mapping)

1. Construct PDA for following grammar

1.  $E \rightarrow I \mid E+E \mid E^*E \mid (E)$

$I \rightarrow a \mid b \mid Ia \mid Ib \mid I0 \mid I1$  (C311.4)(Synthesis) 5M

2. Transform the following CFG to GNF

$S \rightarrow AA \mid a$

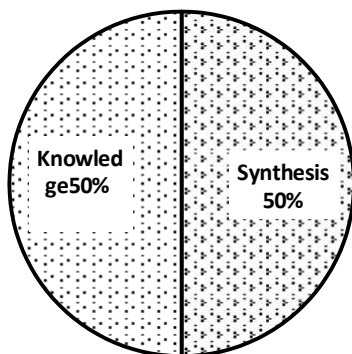
$A \rightarrow SS \mid b$  (C311.5)( Knowledge)5M

3. Construct a TM that will accept the language consists of all Palindromes of 0's and 1's

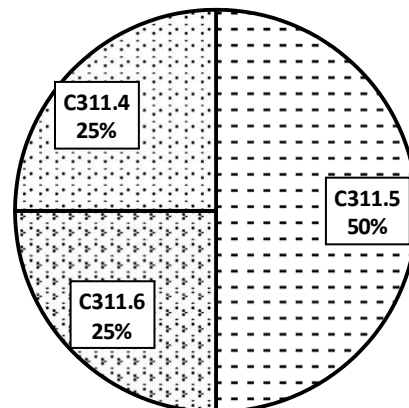
(C311.5)(Synthesis)5M

4. Define post correspondence problem and show that it is undecidable.(C311.6)(Knowledge) 5M

## QUESTIONPAPER MAPPINGWITHBT'S



## QUESTIONPAPER MAPPINGWITHCO'S



# SriInduInstituteofEngineering&Technology

Sheriguda(V),Ibrahimpnam(M),R.R.Dist-501 510

II-MidExaminations,JAN-2023

Set-II

Year&Branch:III-CSE(A,B,C)

Date: 21-1-2023 (FN)

Subject: FLAT

Marks:10

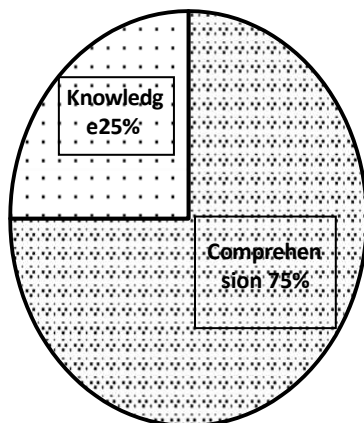
Time:60min

Answer any **TWO** Questions. All Question Carry Equal Marks 2\*5=10marks

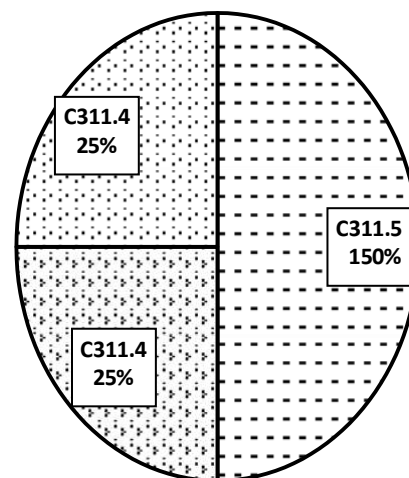
(This question paper is prepared with Course Outcome and BT's mapping)

1. ConstructPDA for following grammar $E \rightarrow I \mid E+E \mid E * E \mid (E)$   
 $I \rightarrow a \mid b \mid Ia \mid Ib \mid I0 \mid I1$  (C311.4) (Comprehension) 5M
2. Transform the following CFG to GNFS- $\rightarrow AA \mid a$   
 $A \rightarrow SS \mid b$  (C311.5) (Comprehension)5M
3. Construct a TM that will accept the language consists of all  
Palindromes of 0's and 1's (C311.5) (Comprehension)5M
4. Define post correspondence problem and show that it is undecidable.(C311.6) (Knowledge) 5M

## QUESTIONPAPER MAPPING WITHBT'S



## QUESTIONPAPER MAPPINGWITHCO'S





# Sri Indu Institute of Engineering & Technology

Shereguda (V), Ibrahimpatnam (M), R.R.Dist-501 510

B-Tech III Year I sem - Mid Examinations, Jan-2023

## Objective Type Exam

Year & Branch: **III Year I Sem**

Date: 21-1-2023

Subject: **FLAT**

Max. Marks: 10

Time: 20 mins

Name: ..... Roll No.....

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### Choose the correct answers.

1. In the finite automaton with minimum state deterministic that accepts a given language  $L = \{w \mid w \in \{0,1\}^*, \text{ the total number of 0s as well as 1s in } w \text{ that would be divisible by 3 \& 5, respectively}\}$  would have:

- a. 9 states   b)10 states   c)11 states   d)15 states

2. If we consider an arbitrary NFA (non-deterministic finite automaton) with  $N$  states in total, the maximum number of states that are there in an equivalent DFA (minimised) is at least:

- a.  $N!$    b) $2N$    c) $2^N$    d) $N^2$

3. Which one of these given regular expressions isn't equivalent to this regular expression:

$(m + n + o)^*$

- a.  $(m^*n^* + o^*)^*$    b.  $((mn)^* + o^*)^*$    c.  $(m^*n^*o^*)^*$    d.  $(m^* + n^* + o^*)^*$

4. Consider that we have a  $G$  ambiguous grammar along with its  $D$  disambiguated version. If the language that is recognized by these two grammars is denoted by  $L(G)$  and  $L(D)$ , then which one of these would be true

- a) $L(D) = L(G)$    b) $L(D) \subset L(G)$    c) $L(D)$  is empty   d) $L(D) \supset L(G)$

5. If you consider a regular expression  $r$ , in which  $r = (11 + 111)^*$  over  $\Sigma = \{0, 1\}$ , then the number of states in minimal DFA and NFA respectively are:

- a. DFA – 4, NFA – 3   b)DFA – 3, NFA – 3   c)DFA – 3, NFA – 4   d)DFA – 4, NFA – 4

6. The language that a Pushdown Automation accepts in which the stack stays limited to about 10 items is described best as:

- a. Recursive   b)Deterministic Context Free   c)Regular   d)Context Free

7. The C language is a:

- a. Regular language   b)Context free language   c)Language parsable fully by a Turing machine only   d)Context sensitive language

8. Consider the language given below:  $\{a^m b^n C^{(m+n)} \mid m, n \geq 1\}$  It is a \_\_\_\_\_ language.

- a. Regular    b) not context free but context sensitive  
c) not context sensitive but type-0    d) not regular but context-free

9. Consider the following languages:

$$L1 = \{0^i 1^j \mid i \neq 2j\}$$

$$L2 = \{0^i 1^j \mid i = 2j+1\}$$

$$L3 = \{0^i 1^j \mid i = j\}$$

$$L4 = \{0^i 1^j \mid i \neq j\}$$

10. Which of these is/are context free:

- a. Only L3    b) Only L3 & L2    c) Only L4 & L3    d) All L1, L2, L3, and L4

11. The  $L = \{0^i 2^j 1^i \mid i \geq 0\}$  language over the  $\{0, 1, 2\}$  alphabet is:

- a. a CFL but not a deterministic CFL    b) a regular language  
c) is recursive as well as a deterministic CFL    d) not recursive.

### Fill in the Blanks

1. The format:  $A \rightarrow aB$  refers to \_\_\_\_\_

2. \_\_\_\_\_ does not have left recursions.

3. Every grammar in Chomsky Normal Form is \_\_\_\_\_

4. Let  $G$  be a grammar. When the production in  $G$  satisfy certain restrictions, then  $G$  is said to be in \_\_\_\_\_

5. Let  $G$  be a grammar:  $S \rightarrow AB|e$ ,  $A \rightarrow a$ ,  $B \rightarrow b$ , Is the given grammar in CNF (True/False) \_\_\_\_\_

6. CFG is not closed under \_\_\_\_\_

7. Recursive languages are Accepted by \_\_\_\_\_

8. \_\_\_\_\_ problem are unsolvable?

9. The value of  $n$  if turing machine is defined using  $n$ -tuples: \_\_\_\_\_

10. A language  $L$  is said to be \_\_\_\_\_ if there is a turing machine  $M$  such that  $L(M) = L$  and  $M$  halts at every point.

# SriInduInstituteofEngineering&Technology

Sheriguda(V),Ibrahimpattam(M),R.R.Dist-501510

I- MidExaminations,NOV-2022

Set-I

Year&Branch:III-CSE(A,B,C)

Date: 14-11-2022 (FN)

Subject:FLAT

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## ANSWERKEY Descriptivepaperkey link:

[https://docs.google.com/document/d/1aikG5LNUq34ZZwnW3MSERziHbKaBJw1z/edit?usp=drive\\_link&oid=101934197796008722334&rtpof=true&sd=true](https://docs.google.com/document/d/1aikG5LNUq34ZZwnW3MSERziHbKaBJw1z/edit?usp=drive_link&oid=101934197796008722334&rtpof=true&sd=true)

### Answer key

1. Deterministic finite automata
2. C)  $\Sigma$
3. C) 5
4. B) 5
5. B) Mooi'e
6. A. infinitely many state but finitely many accept states.
7. b) union
8.  $\epsilon$
9. b) 5 tuples
10. d) Output Alphabet

### Fill in the blanks

- 1  $R^+$
2. 5
3.  $\{0,1,0,1,\epsilon\} [0^+\Sigma] [1^+\epsilon]$
4. Pigeon-hole principle
5. R
6.  $A^*$
7.  $\epsilon$  reachable states
8.  $QP^*$
9. Non-null transistors
10. Recursive

# SriInduInstituteofEngineering&Technology

Sheriguda(V),Ibrahimpattam(M),R.R.Dist-501510

II-MidExaminations,Jan-2023

Set-II

Year&Branch:III-CSE(A,B,C)

Date: 21-1-2023 (FN)

Subject:FLAT

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## **ANSWERKEY** **Descriptivepaperkey link:**

[https://docs.google.com/document/d/16ooJNxd6GVuNHp6LvXTRS0QAZ\\_28ymJk/edit?usp=drive\\_link&oid=101934197796008722334&rtpof=true&sd=true](https://docs.google.com/document/d/16ooJNxd6GVuNHp6LvXTRS0QAZ_28ymJk/edit?usp=drive_link&oid=101934197796008722334&rtpof=true&sd=true)

### **Answers key**

1.d 2.c 3.a 4.a 5.c 6.b 7.d 8.d 9.c 10.c

### **Fill in the blanks**

- 1.greibacg noemal form
2. greibacg noemal form
- 3.context free
- 4.normal form
- 5.true
- 6.complementation
- 7.turing machine
- 8.halting problem and Boolean satifiability
- 9.7
- 10.decidable



# Sri Indu Institute of Engineering & Technology

Accredited by NAAC A+ Grade, Recognized under 2(f) of UGC Act 1956.

(Approved by AICTE, New Delhi and Affiliated to JNTUH, Hyderabad)

Khalsa Ibrahimpatanam, Sheriguda (V), Ibrahimpatanam (M), Ranga Reddy Dist., Telangana – 501510

Website: <https://siiet.ac.in/>

## Department of Computer Science and Engineering 2022-2023; 1<sup>st</sup> Semester Assignment Questions

Course: Formal Languages and Automata Theory

Class: III –B

(Assignment Questions are mapped with CO's, BT)

### ASSIGNMENT -I

1. Transform the following NFA into the equivalent DFA

$\delta$	0	1
$\rightarrow q0$	{q0,q1}	q1
*q1	$\emptyset$	{q0,q1}

(Comprehension)(C311.1)

2. Construct Moore for the input from  $(0+1)^*$  that give residue modulo 4 of the input treated as binary.

(Synthesis) (C311.1)

3. Identify the regular expression accepted by the following DFA

$\delta$	a	b
$\rightarrow q0$	q2	q1
q1	q3	q2
q2	q0	q3
*q3	-	-

(Knowledge) (C311.2)

4. Design a FA for the following languages

a)  $(0^*1^*)^*$     b)  $(0+1)^*111^*$     c)  $(0^*11^*+101)$

(Synthesis) (C311.2)

5. Explain about: a) Context Free Grammar b) Leftmost Derivation c) Rightmost Derivation



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Khalsa Ibrahimpatanam, Sheriguda (V), Ibrahimpatanam (M), Ranga Reddy Dist., Telangana – 501 510

Website: <https://siiet.ac.in/>

## Department of Computer Science and Engineering

2022-2023; 1<sup>st</sup> Semester

### Assignment Questions

Course: Formal Languages and Automata Theory

Class: III –B

(Assignment Questions are mapped with CO's, BT)

### ASSIGNMENT –II

1. Design a PDA for the following language

$$L = \{0^n 1^{2n} \mid n \geq 1\}$$

(Synthesis) (C311.4)

2. Write the procedure to convert CFG to PDA and also convert the following CFG to PDA

$$S \rightarrow B \mid Aaa$$

$$A \rightarrow Abb \mid a$$

$$B \rightarrow Bbb \mid A$$

$$C \rightarrow a$$

(Knowledge) (C311.4)

3. Transform the following grammar to GNF

$$S \rightarrow ABA \mid AB \mid BA \mid AA \mid B$$

$$A \rightarrow Aa \mid a$$

$$B \rightarrow Bb \mid b$$

(Comprehension) (C311.5)

4. Design a TM to recognize the language

$$L = \{1^n 2^n 3^n \mid n \geq 1\}$$

(Synthesis) (C311.5)

5. Define Post's Correspondence problem and show that it is undecidable.

(Knowledge) (C311.6)



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Website : <https://siiet.ac.in/>

## Department of Computer Science and Engineering 2022-2023; 1<sup>st</sup> Semester

### Result Analysis:

Course Title	Formal Languages and Automata Theory
Course Code	CS501PC
Programme	B.Tech
Year & Semester	III year I-semester, B sec
Regulation	R18
Course Faculty	Mrs.R.Sravanthi, Assistant Professor , CSE

### Weak Students:

S No	Roll no	No of backlogs	Internal-I Status	Internal-II Status
1	20X31A0570	5	18(P)	18(P)
2	20X31A0573	4	12(P)	12(P)
3	20X31A0575	4	16(P)	16(P)
4	20X31A0578	4	17(P)	17(P)
5	20X31A0580	5	11(P)	11(P)
6	20X31A0582	5	13(P)	13(P)
7	20X31A0585	3	16(P)	16(P)
8	20X31A0587	4	17(P)	17(P)
9	20X31A0591	4	12(P)	12(P)
10	20X31A0594	3	18(P)	18(P)
11	20X31A0595	4	9(P)	9(P)
12	20X31A05A2	5	16(P)	16(P)

13	20X31A05A6	5	14(P)	14(P)
14	20X31A05A8	3	17(P)	17(P)
15	20X31A05A9	3	18(P)	18(P)

**Advanced learners:**

S No	Roll No	(SGPA)	Gate Material
1	20X31A0568	7.02	<ol style="list-style-type: none"> <li>1. Regular expressions and finite automata.</li> <li>2. Context-free grammars and push-down automata.</li> <li>3. Regular and context-free languages, pumping lemma.</li> <li>4. Turing machines and undecidability.</li> </ol>
2	20X31A0596	7.3	
3	20X31A0597	7.5	
4	20X31A05B1	7.4	
5	20X31A05B2	7.4	
6	20X31A05B3	7.4	
7	20X31A05B4	7.2	
8	20X31A05B7	7.2	





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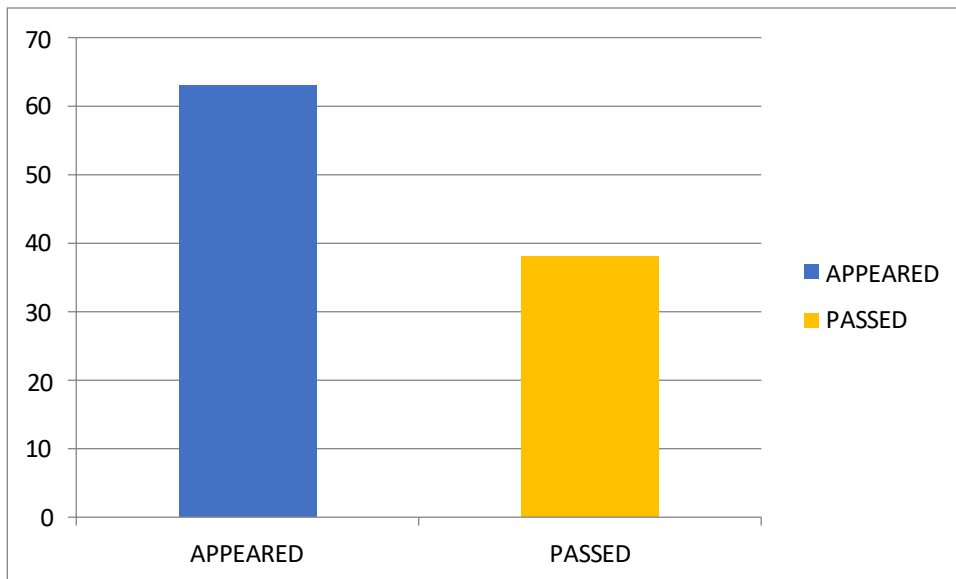
(Approved by AICTE, New Delhi and Affiliated to JNTUH, Hyderabad)

Khalsa Ibrahimpatanam, Sheriguda (V), Ibrahimpatanam (M), Ranga Reddy Dist., Telangana 501510

Website : <https://siiet.ac.in/>

## BATCH ECE-III BTECH I SEM CSE-B RESULT ANALYSIS

ACADAMIC YEAR	COURSE NAME	NUMBER OF STUDENTS		QUESTION PAPER SETTING		PASS%
		APPEARED	PASSED	INTERNAL	EXTERNAL	
2022-23	FLAT	65	32	COURSE FACULTY	JNTUH	60.33



### Formal Language and Automata Theory (CS501PC) Result Analysis



# SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution under UGC)

Accredited by NAAC with A+ Grade, Recognized under 2(f) of UGC Act 1956

(Approved by AICTE, New Delhi and Affiliated to JNTUH, Hyderabad)

Khalsa Ibrahimpatnam, Sherguda (V), Ibrahimpatnam (M), Ranga Reddy Dist., Telangana – 501 510

Website: <https://siiet.ac.in/>

## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

### REMEDIAL CLASSES TIME TABLE

A.Y 2022-23

SEMESTER-I

BRANCH/ SEC	MON 4.00 PM- 5.00 PM	TUE 4.00 PM-5.00 PM	WED 4.00 PM- 5.00 PM	THUR 4.00 PM- 5.00 PM	FRI 4.00 PM- 5.00 PM
II CSE-A	A&DE	DS	C++	COA	COSM
II CSE-B	DS	A&DE	COSM	C++	COA
II CSE-C	COSM	COA	A&DE	DS	C++
III CSE-A	SE	FLAT	CN	WT	PPL
III CSE-B	WT	CN	SE	PPL	FLAT
III CSE-C	FLAT	WT	PPL	CN	SE
IV CSE-A	C&NS	DM	CC	POE	RTS
IV CSE-B	CC	RTS	C&NS	DM	POE
IV CSE-C	RTS	CC	POE	C&NS	DM

  
HOD

Computer Science & Engg. Dept.  
SRI INDU INSTITUTE OF ENGG & TECH.  
Sherguda(V), Ibrahimpatnam(M), R.R.Dist-501 510



PRINCIPAL  
PRINCIPAL

Sri Indu Institute of Engineering & Techno.  
Sherguda(VIII), Ibrahimpatnam  
R.R. Dist. Telangana -501 510



30	20X31A0589				3			3					6	5	
31	20X31A0590	3						3					6	5	
32	20X31A0591				3			3					6	5	
33	20X31A0592	4			4								8	5	
34	20X31A0593				5			5					8	5	
35	20X31A0594	5			5								8	5	
36	20X31A0595	3			2								4	5	
37	20X31A0596	5			5								10	5	
38	20X31A0597				5			4					9	5	
39	20X31A0598				4			4					9	5	
40	20X31A0599	4						4					9	5	
41	20X31A05A0	5			4								9	5	
42	20X31A05A1	5			5								10	5	
43	20X31A05A2	4			3								9	5	
44	20X31A05A3	4			3								9	5	
45	20X31A05A4				4			3					9	5	
46	20X31A05A5	5			4								9	5	
47	20X31A05A6	3			3								8	5	
48	20X31A05A7	4			3								9	5	
49	20X31A05A8				4			4					9	5	
50	20X31A05A9	5			5								8	5	
51	20X31A05B0				4			4					9	5	
52	20X31A05B1	5			5								9	5	
53	20X31A05B2				5			5					10	5	
54	20X31A05B3	5						5					9	5	
55	20X31A05B4	4			4								10	5	
56	20X31A05B5	3			3								8	5	
57	20X31A05B6	3			3								8	5	
58	20X31A05B7	5			4								7	5	
59	20X31A05B8	5			5			5					8	5	
60	20X31A05B9	5			5								8	5	
61	20X31A05C0	5			5								8	5	
62	20X31A0506	5						5					8	5	
63	20X31A0507	4						5					8	5	
64	20X31A0508	5			5								9	5	
65	20X31A0509	5						5					9	5	
66	20X31A0510	5			5								8	5	
Target set by the faculty / HoD		3.00	0.00	0.00	3.00	0.00	0.00	3.00	0.00	0.00	3.00	0.00	0.00	6.00	3.00
Number of students performed above the target		43	0	0	48	0	0	28	0	0	9	0	0	63	65

Number of students attempted	43	0	0	50	0	0	28	0	0	10	0	0	65	65
Percentage of students scored more than target	##			96%			100%			90%			97%	100%

**CO Mapping with Exam Questions:**

CO - 1	Y												y	y
CO - 2				Y			Y	Y					y	y
CO - 3										Y			y	y
CO - 4														
CO - 5														
CO - 6														

**CO Attainment based on Exam Questions:**

CO - 1	###												97%	100%
CO - 2				96%									97%	100%
CO - 3										90%			97%	100%
CO - 4														
CO - 5														
CO - 6														

CO	Subj	obj	Asgn	Overall	Level
CO-1	###	97%	100%	99%	3.00
CO-2	96%	97%	100%	98%	3.00
CO-3	90%	97%	100%	96%	3.00
CO-4					
CO-5					
CO-6					

Attainment Level	
1	40%
2	50%
3	>60%

Attainment (Internal 1 Examination) = **3.00**



30	20X31A0589				3			3					6	5	
31	20X31A0590	3						3					6	5	
32	20X31A0591				3			3					6	5	
33	20X31A0592	4			4								8	5	
34	20X31A0593				5			5					8	5	
35	20X31A0594	5			5								8	5	
36	20X31A0595	3			2								4	5	
37	20X31A0596	5			5								10	5	
38	20X31A0597				5			4					9	5	
39	20X31A0598				4			4					9	5	
40	20X31A0599	4						4					9	5	
41	20X31A05A0	5			4								9	5	
42	20X31A05A1	5			5								10	5	
43	20X31A05A2	4			3								9	5	
44	20X31A05A3	4			3								9	5	
45	20X31A05A4				4			3					9	5	
46	20X31A05A5	5			4								9	5	
47	20X31A05A6	3			3								8	5	
48	20X31A05A7	4			3								9	5	
49	20X31A05A8				4			4					9	5	
50	20X31A05A9	5			5								8	5	
51	20X31A05B0				4			4					9	5	
52	20X31A05B1	5			5								9	5	
53	20X31A05B2				5			5					10	5	
54	20X31A05B3	5						5					9	5	
55	20X31A05B4	4			4								10	5	
56	20X31A05B5	3			3								8	5	
57	20X31A05B6	3			3								8	5	
58	20X31A05B7	5			4								7	5	
59	20X31A05B8	5			5			5					8	5	
60	20X31A05B9	5			5								8	5	
61	20X31A05C0	5			5								8	5	
62	20X31A0506	5						5					8	5	
63	20X31A0507	4						5					8	5	
64	20X31A0508	5			5								9	5	
65	20X31A0509	5						5					9	5	
66	20X31A0510	5			5								8	5	
Target set by the faculty / HoD		3.00	0.00	0.00	3.00	0.00	0.00	3.00	0.00	0.00	3.00	0.00	0.00	6.00	3.00
Number of students performed above the target		43	0	0	48	0	0	28	0	0	9	0	0	63	65

Number of students attempted	43	0	0	50	0	0	28	0	0	10	0	0	65	65
Percentage of students scored more than target	##			96%			100%			90%			97%	100%





# SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Computer Science and Engineering

## Course Outcome Attainment (University Examinations)

Name of the faculty : R.SSRAVANTHI

Academic Year:2022-2023

Branch & Section: CSE-B

Year / Semester: III/I

Course Name: FORMAL LANGUAGE AND AUTOMATA THEORY

S.No	Roll Number	Marks Secured
1	20X31A0561	26
2	20X31A0562	26
3	20X31A0563	11
4	20X31A0564	7
5	20X31A0565	15
6	20X31A0566	11
7	20X31A0567	26
8	20X31A0568	26
9	20X31A0569	31
10	20X31A0570	19
11	20X31A0571	26
12	20X31A0572	15
13	20X31A0573	
14	20X31A0574	26
15	20X31A0575	12
16	20X31A0576	12
17	20X31A0577	26
18	20X31A0578	12
19	20X31A0579	26
20	20X31A0580	0
21	20X31A0581	31
22	20X31A0582	1
23	20X31A0583	31
24	20X31A0584	
25	20X31A0585	7
26	20X31A0586	26
27	20X31A0587	2
28	20X31A0588	18
29	20X31A0589	30
30	20X31A0590	18
31	20X31A0591	3
32	20X31A0592	26
33	20X31A0593	32
34	20X31A0594	7

S.No	Roll Number	Marks Secured
36	20X31A0596	26
37	20X31A0597	26
38	20X31A0598	30
39	20X31A0599	13
40	20X31A05A0	18
41	20X31A05A1	26
42	20X31A05A2	1
43	20X31A05A3	15
44	20X31A05A4	11
45	20X31A05A5	31
46	20X31A05A6	3
47	20X31A05A7	35
48	20X31A05A8	7
49	20X31A05A9	2
50	20X31A05B0	34
51	20X31A05B1	29
52	20X31A05B2	33
53	20X31A05B3	28
54	20X31A05B4	32
55	20X31A05B5	15
56	20X31A05B6	8
57	20X31A05B7	28
58	20X31A055B8	32
59	20X31A05B9	31
60	21X35A05C0	19
61	21X35A0506	16
62	21X35A0507	6
63	21X35A0508	32
64	21X35A0509	26
65	21X35A0510	34

35	20X31A0595	12
Max Marks		75
Class Average mark		20
Number of students performed above the target		32
Number of successful students		62
Percentage of students scored more than target		52%
<b>Attainment level</b>		<b>2</b>

Attainment Level	% students
1	40%
2	50%
3	>60%

**CO Mapping with Exam Questions:**

CO - 1	Y													y	y
CO - 2			Y			Y	Y							y	y
CO - 3									Y					y	y
CO - 4															
CO - 5															
CO - 6															

**CO Attainment based on Exam Questions:**

CO - 1	###													97%	100%
CO - 2			96%											97%	100%
CO - 3									90%					97%	100%
CO - 4															
CO - 5															
CO - 6															

CO	Subj	obj	Asgn	Overall	Level
CO-1	###	97%	100%	99%	3.00
CO-2	96%	97%	100%	98%	3.00
CO-3	90%	97%	100%	96%	3.00
CO-4					
CO-5					
CO-6					

Attainment Level	
1	40%
2	50%
3	>60%

Attainment (Internal 1 Examination) =

**3.00**



# SRI INDU INSTITUTE OF ENGINEERING & TECHNOLOGY

Department of Computer Science and Engineering

## Program Outcome Attainment (from Course)

Name of Faculty: R.SRAVANTHI Academic Year: 2022-2023  
 Branch & Section: CSE- B Year: III-I  
 Course Name: FORMAL LANGUAGE AND AUTOMATA THEORY Semester: III-I

### CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		2									
CO2	3		2		1							
CO3	3		2		1							
CO4	2										3	
CO5			3					2				
CO6												
<b>Course</b>	<b>2.75</b>	<b>0.00</b>	<b>2.25</b>	<b>0.00</b>	<b>1.00</b>	<b>0.00</b>	<b>0.00</b>	<b>2.00</b>	<b>0.00</b>	<b>0.00</b>	<b>3.00</b>	<b>0.00</b>

CO	Course Outcome Attainment
	3.00
<b>CO1</b>	3.00
<b>CO2</b>	3.00
<b>CO3</b>	0.90
<b>CO4</b>	3.00
<b>CO5</b>	3.00
<b>CO6</b>	3.00
<b>Overall course attainment level</b>	<b>2.65</b>

### PO-ATTAINMENT

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO Attainment</b>	<b>2.43</b>	<b>0.00</b>	<b>1.99</b>	<b>0.00</b>	<b>0.88</b>	<b>0.00</b>	<b>0.00</b>	<b>1.77</b>	<b>0.00</b>	<b>0.00</b>	<b>2.65</b>	<b>0.00</b>

CO contribution to PO - 33%, 67%, 100% (Level 1/2/3)



# **Sri Indu Institute of Engineering & Technology**

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(Approved by AICTE, New Delhi and Affiliated to JNTUH, Hyderabad) Khalsa

Ibrahimpatanam, Sheriguda (V), Ibrahimpatanam (M), Ranga Reddy Dist., Telangana 501510

Website : <https://siiet.ac.in/>

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## **ASSIGNMENTS AND ATTENDANCE REGISTER**

**Assignment-1 Script link:**

[https://drive.google.com/file/d/1wD47hJoLzGRrwSc\\_KIF5C3KXU-  
ra\\_Cbt/view?usp=sharing](https://drive.google.com/file/d/1wD47hJoLzGRrwSc_KIF5C3KXU-<br/>ra_Cbt/view?usp=sharing)

**Assignment-2 Script link:**

<https://drive.google.com/file/d/1pRt0vzfWXF2hdRWWUDVI93TrHGd0d8xj/view?usp=sharing>

**Attendance Register Link:**

[https://drive.google.com/file/d/1im6cjHOGiUq-  
wwaNO9ArIX1Pr4r0FJyd/view?usp=sharing](https://drive.google.com/file/d/1im6cjHOGiUq-<br/>wwaNO9ArIX1Pr4r0FJyd/view?usp=sharing)