



R22 Regulation

Subject code: 4E6FC

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech VI Semester Supplementary Examinations, November 2025

AUTOMATA THEORY AND COMPILER DESIGN

(IT)

Maximum Marks: 60

Date: 21.11.2025

Duration: 3 hours

- Note:**
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	Bloom Tx
1.a)	Which automaton can have multiple transitions for the same input from a state?	1M	CO1	1
b)	What is the name of the diagram used to represent automata visually?	1M	CO1	1
c)	State one algebraic law for regular expressions.	1M	CO2	1
d)	What is meant by leftmost derivation in context-free grammars?	1M	CO2	1
e)	How does a PDA accept a string?	1M	CO3	1
f)	What kind of languages is accepted by Turing Machines?	1M	CO3	1
g)	What is a lexeme?	1M	CO4	1
h)	Which parsing technique is used in LR parsers?	1M	CO4	1
i)	What are the two types of attributes used in SDDs?	1M	CO5	1
j)	Which data structure is used for dynamic memory allocation?	1M	CO5	1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	a) Define Deterministic Finite Automaton (DFA) formally. How does a DFA process a given input string? Illustrate with a state diagram.	5M	CO1	3
	b) Write the formal definition of an NFA and construct one for the language of strings over {a, b} that end with "ab".	5M		6
OR				
3	a) What are ϵ -transitions in NFAs? How are they handled during conversion to DFA? Explain with an example.	5M	CO1	3
	b) Explain the process of converting an NFA to a DFA. Use an example with a state transition table or diagram to show the steps.	5M		3
4	a) Explain any two algebraic laws for regular expressions with examples. How do these laws help simplify or manipulate regular expressions?	5M	CO2	2
		5M		3

	b) Define parse trees. How do parse trees help in understanding the structure of strings generated by a grammar? Illustrate with an example.			
	OR			
5	a) Define a Context-Free Grammar (CFG). Explain the components of a CFG with an example of a simple grammar that generates a language. b) State and explain the Pumping Lemma for regular languages. How can the pumping lemma be used to prove that a language is not regular?	5M 5M	CO2	2 2
6	a) Prove that every Context-Free Grammar (CFG) has an equivalent Pushdown Automaton (PDA). Outline the construction. b) What is an Instantaneous Description (ID) in a Turing Machine? Explain with a state transition example.	5M 5M	CO3	3 2
	OR			
7	a) Discuss the difference between decidable and Turing-recognizable (RE) languages with examples. b) Explain with an example: An undecidable problem that is RE.	5M 5M	CO3	5 2
8	Explain the structure of a compiler in detail with a neat block diagram.	10M	CO4	3
	OR			
9	Compare SLR, LALR, and Canonical LR parsers. Discuss their relative strengths and weaknesses with examples of grammar types each can handle.	10M	CO4	6
10	Generate intermediate code (TAC) for an arithmetic expression: Example: $a = b * - c + b * - c$ Show how common sub expression elimination is handled.	10M	CO5	3
	OR			
11	What is heap management in runtime environments? Explain the memory allocation strategies with example.	10M	CO5	2