R22 Regulation *Subject code: 4E5EA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.TechV Semester Regular/Supplementary Examinations, November 2025

FORMAL LANGUAGES AND AUTOMATA THEORY

(CSE)

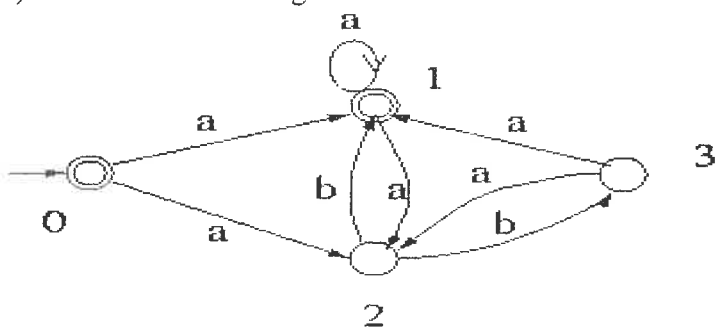
Maximum Marks: 60 Date: 22.11.2025 Duration: 3 hours

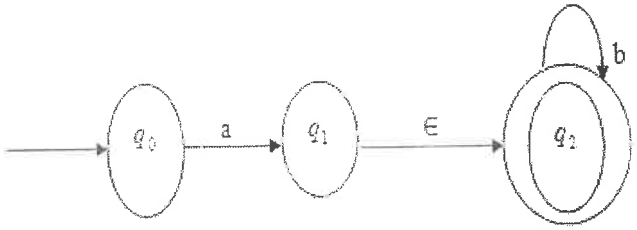
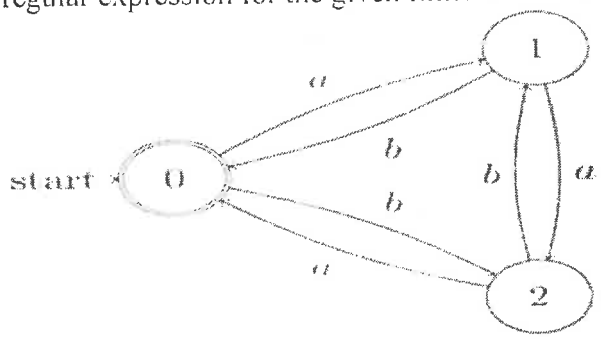
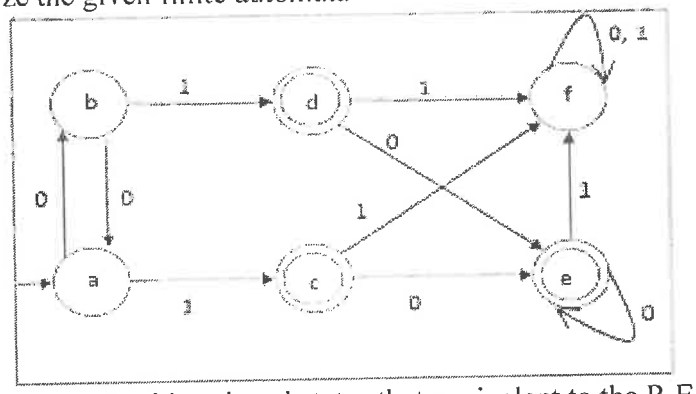
Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	Bloom Tx
1a)	What is the difference between star closure and positive closure.	1M	1	L2
b)	Name the elements of finite automata	1M	1	L1
c)	What is the principle used in pumping lemma for regular sets	1M	2	L1
d)	State the applications of regular expressions	1M	2	L1
e)	What is the ambiguity in CFG?	1M	3	L1
f)	Differentiate final state and empty stack acceptance of a PDA	1M	3	L2
g)	Define the mathematical model of Turing machine	1M	4	L1
h)	What are the advantages of converting a grammar into normal form?	1M	4	L1
i)	Define polynomial time	1M	5	L1
j)	Give some examples that fall into the class of P and NP	1M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx level
2	a) Convert the following NFA into DFA 	5M	1	L2
	b) Design a DFA for the set of all strings with exactly 3 consecutive zeros. Σ={0,1}	5M	1	L5
	OR			
3	a) Design a Moore machine to determine residue mod 3 for each ternary string treated as integer.	5M 5M	1 1	L5 L2

	b) Convert the following NFA with Ɛ-moves into equivalent NFA without Ɛ-moves 			
4	a) Prove that the following languages are not regular $L= \{a^i b^{2i} / i>0\}$ b) Construct regular expression for the given finite automata 	4M 6M	2 2	L3 L3
	OR			
5	a) Minimize the given finite automata  b)Construct a DFA with reduced states that equivalent to the R.E $(1+0)^*(00+11)(0+1)^*$	5M 5M	2 2	L3 L3
6	a) Explain the graphical notation of PDA with an example and acceptance of context free languages by PDA b) Design a PDA for the grammar having productions S->0A, A->0ABC/1B/0, B->1, C->2	5M 5M	3 3	L2 L5
	OR			

7	a)Construct the context free grammar G which accepts the PDA A by empty stack, where A=({q0, q1}, {a, b}, {Z0,Z}, δ, q0,Z0, φ).δ is given by δ(q0, b,Z0) = {(q0,ZZ0)}, δ(q0,^,Z0) = {(q0, L)}, δ(q0, b,Z) = {(q0,ZZ)}, δ(q0, a,Z) = {(q1,Z)},δ(q1, b,Z) = {(q1,^)}, δ(q1, a,Z0) = {(q0,Z0)} b) Consider a CFG S →bA/aB; A →aS/aAA/a; B →bS/aBB/b. Find LMD and RMD for w=aaabbabbba	5M 5M	3 3	L3 L3
8	a) Convert the following grammar G having productions E → E + T / T, T → T * F / F, F → (E) / id, into equivalent CNF grammar. b) Explain the techniques for construction of Turing Machine.	5M 5M	4 4	L2 L2
	OR			
9	a) Design a Turing machine that accepts L = $\{a^n b^n c^n / n \geq 1\}$ b) Describe programming techniques used in Turing Machines.	5M 5M	4 4	L5 L2
10	a) Discuss briefly bout the following (i) Recursively Enumerable (REL) & Recursive Languages (RL) (ii) Halting Problem: b) Explain about the Decidability and Undecidability Problems	5M 5M	5 5	L2 L2
	OR			
11	a) Find whether the post correspondence problem, P = {(11, 11), (100, 001) (111,11)} has a match. Give the solution. b) Define P, NP and NPC and relationship between them with example	5M 5M	5 5	L3 L2