R20 Regulation *Subject code: 3P3HC*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Supplementary Examinations, February 2024
FORMAL LANGUAGES & AUTOMATA THEORY
(CSD)

Maximum Marks: 70 Date: 21.02.2024 Duration: 3 hou

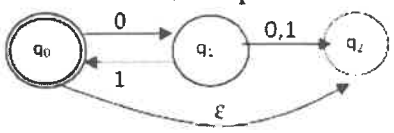
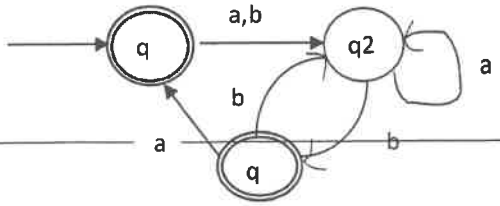
Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		CO	Blo Tx
1	Define NFA with ∈- moves.	CO1	L1
2	What is Kleene Closure and Positive Closure?	CO1	L1
3	Write the regular expressions for the language of Strings with three consecutive 1's over the alphabet 'Σ = {0, 1} .	CO2	L2
4	How do you prove a language is regular?	CO2	L1
5	Define Context Free Grammar.	CO3	L1
6	Does push down automata have memory? Give explanation.	CO3	L1
7	What are the components of a Turing Machine?	CO4	L1
8	How is a two stack PDA equivalent to a Turing machine?	CO4	L1
9	Define unrestricted grammar?	CO5	L1
10	Why is the halting problem undecidable?	CO5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)

11	Discuss the Mathematical representation of Finite State Machine FSM? Construct a DFA equivalent to the NFA given below 	10M	CO1	L3
	OR			
12	(a)Give a DFA for Σ = {a, b} that accepts any string with *aababb* as a substring. (b)Define Moore Machine. Design a Moore machine for 2's complement of binary number.	5M 5M	CO1	L1
13	(a) Convert the following DFA to a regular expression. 	7M	CO2	L2

	(b)Explain about the identity rules of Regular Expressions?	3M		
	OR			
14	(a) Explain about Algorithm for minimizing DFA? (b) Construct Minimum state Automata for the following DFA ? * denotes final state	4M 6M	CO2	L2 L3
15	(a)Define PDA. Construct a PDA that accepts language $L = \{ ww^R \mid w = (a+b)^* \}$. (b)Differentiate between Deterministic PDA and Non-deterministic PDA.	6M 4M	CO3	L1 L2
	OR			
16	(a)Define Ambiguous Grammar? Check whether the grammar E->E+E,E->E*E, E->id Is Ambiguous or not string:id+id*id? (b)Construct Left most derivation for the string aabbaaa? The Grammar is {S→AS|a, A→SbA|SS|ba}	6M 4M	CO3	L1 L3
17	(a) State and Explain the closure properties of CFG. (b) Consider the CFG with {S,A,B} as the non-terminal alphabet, {a,b, ε} as the terminal alphabet, S as the start symbol and the following set of production rules S→ASA | aB A→B|S B→b|ε Convert the given grammar into CNF	4M 6M	CO4	L5 L2
	OR			
18	Define Turing Machine. Construct a Turing Machine for language $L = \{0^n1^n2^n \mid n \geq 1\}$.	10M	CO4	L1
19	(a) Define Post Correspondence Problem? Explain in brief about PCP with an example? (b) Explain about recursive and recursively enumerable language.	7M 3M	CO5	L1
	OR			
20	Explain in detail about P, NP, NP-complete and NP-hard problems with real time examples for each.	10M	CO5	L1

δ	0	1
→ q1	q2	q3
q 2	q3	q5
*q 3	q4	q3
q 4	q3	q5
*q5	q2	q5