R20 Regulation *Subject code: 3P4FF*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, June 2026

FORMAL LANGUAGES & AUTOMATA THEORY

(IT)

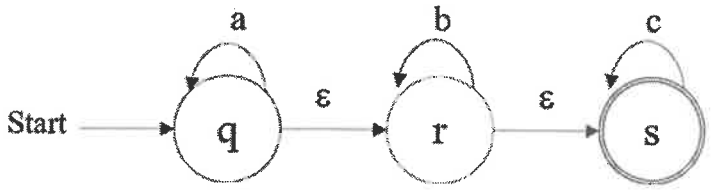
Maximum Marks: 70 Date:17.06.2026 Duration: 3 hours

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)		Marks	CO	BTL
1	Define the terms symbol, string and Language.	2M	1	L1
2	Write the difference between DFA and NFA.	2M	1	L1
3	Define Regular Expression.	2M	2	L1
4	Define the pumping lemma for regular expressions.	2M	2	L1
5	Define Grammar.	2M	3	L1
6	Write the formal definition of PDA.	2M	3	L1
7	What is the use of normalization?	2M	4	L1
8	Define Turing Machine.	2M	4	L1
9	Define Recursively enumerable languages.	2M	5	L1
10	Define Undecidability.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	a) Construct a Mealy machine that take set of all strings over alphabet {0, 1} and make 1's complement of an input bit string in binary number. b) Construct DFA to accept the language of all strings of even number of a's and number of b's over alphabet Σ={a,b}	5M 5M	1	L2
	OR			
12	Tabulate the difference between the NFA and DFA. Convert the following ε-NFA to DFA. 	10M	1	L2
13	Define regular expression? Find out the regular expression where Σ ={a,b} a) where length is at least 2 b) where length is even c) where length is odd	10M	2	L2

<table>
<tr><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td>14</td><td>Explain the procedure of equivalence between Finite Automata & find out whether the given FA are equivalent or not.
Finite automata 'A
<table><tr><td>State/Σ</td><td>c</td><td>d</td></tr><tr><td>→ Q_1*</td><td>Q_1</td><td>Q_2</td></tr><tr><td>Q_2</td><td>Q_3</td><td>Q_1</td></tr><tr><td>Q_3</td><td>Q_2</td><td>Q_3</td></tr></table>Finite automata 'B'
<table><tr><td>State/Σ</td><td>c</td><td>d</td></tr><tr><td>→Q_4*</td><td>Q_4</td><td>Q_5</td></tr><tr><td>Q_5</td><td>Q_6</td><td>Q_4</td></tr><tr><td>Q_6</td><td>Q_7</td><td>Q_6</td></tr><tr><td>Q_7</td><td>Q_6</td><td>Q_4</td></tr></table></td><td>10M</td><td>2</td><td>L2</td></tr>
<tr><td>15</td><td>Construct a PDA for the given language
L={a^n b^n/n>=1} and write the instantaneous description for the string "aaabbb".</td><td>10M</td><td>3</td><td>L2</td></tr>
<tr><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td>16</td><td>a) Explain the process of simplification of the grammar.
b) Explain left most and right most derivations with examples.</td><td>5M
5M</td><td>3</td><td>L2</td></tr>
<tr><td>17</td><td>Explain closure properties of context free grammar with proofs.</td><td>10M</td><td>4</td><td>L2</td></tr>
<tr><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td>18</td><td>Design a Turing machine for unary multiplication.</td><td>10M</td><td>4</td><td>L2</td></tr>
<tr><td>19</td><td>a) Discuss in brief about NP-Hard problems.
b) Explain about the Decidability and Undecidability problems.</td><td>5M
5M</td><td>5</td><td>L2</td></tr>
<tr><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td>20</td><td>What is Post Correspondence Problem. Verify whether the following PCP has a solution or not?
A={ba,ab,a,baa,b}, B={bab,baa,ba,a,aba}</td><td>10M</td><td>5</td><td>L2</td></tr>
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