Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (S) Examinations (FT/WP) May 2026 (2024 Scheme)

Course Code: PCCST302

Course Name: THEORY OF COMPUTATION

Max. Marks: 60 Duration: 2 hours 30 minutes

PART A

(Answer all questions. Each question carries 3 marks)

		CO	Marks
1	Sketch the design of a finite automaton to recognize the word "the" in a stream of text.	CO2	(3)
2	Draw a simple state diagram representing a coffee vending machine that dispenses a drink when ₹10 is inserted.	CO2	(3)
3	Prove that regular languages are closed under intersection.	CO1	(3)
4	Write regular expression for the following languages. i) to accept all strings that contain any combination of *a's* and *b's* of length 3. ii)String that contains any combination of *a* and *b* of any length. iii) String starts with *a* and ends with *b*.	CO2	(3)
5	Convert the following CFG to Chomsky Normal Form : **S→AB|aB|ϵ , A→aA | B, B→b .**	CO3	(3)
6	State the pumping lemma for context-free languages.	CO1	(3)
7	Give an example of a language accepted by an LBA but not by a PDA.	CO1	(3)
8	List closure properties of recursive and recursively enumerable languages.	CO5	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module -1

9	a)	Minimize the following DFA and Show your steps. Q={ A, B, C, D, E}, Σ= {0, 1}, Initial State: A, Final States: C, D, E and Transitions: δ(A,0)=B,	CO2	6

$\delta(A,1)=C$, $\delta(B,0)=B$, $\delta(B,1)=D$, $\delta(C,0)=B$, $\delta(C,1)=C$, $\delta(D,0)=B$, $\delta(D,1)=E$, $\delta(E,0)=B$, $\delta(E,1)=C$.

b) Convert the following ε-NFA to a NFA without ε moves . Assume that **p** is the start state and **r** is the final state. CO2 3

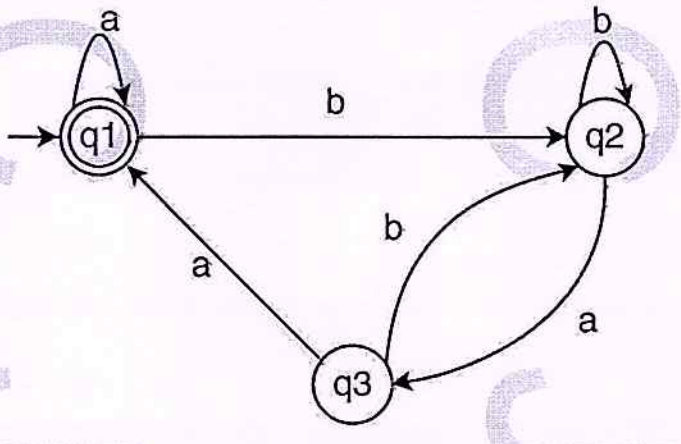
	ε	a	b	c
→p	Φ	{p}	{q}	{r}
q	{p}	{q}	{r}	Φ
*r	{q}	{r}	Φ	{p}

10 a) The University Online Admission Portal requires applicants to enter their Date of Birth (DOB) in the format:DD/MM/YYYY. To ensure that only eligible applicants apply, the system must accept DOBs between 01/01/2000 and 31/12/2010 (both inclusive). As part of the system's input validation module, you are required to design a Deterministic Finite Automaton (DFA) that validates the entered DOB. CO2 6

b) Draw a DFA for the language accepting strings ending in either **'01'** or **'10'** over input alphabets $\Sigma = \{0, 1\}$. CO2 3

Module -2

11 a) Find the regular expression from the given finite automata CO2 5



b) Show that the language $L=\{ 0^n1^{2n} \mid n > 0 \}$ is not regular . CO1 4

12 a) Check whether the following grammar is ambiguous or not. CO3 5

$E \rightarrow E + E \mid E^*E \mid (E) \mid a$

	b)	Design a Context Free Grammar for the language, $L=\{a^n b^m \mid n,m \geq 1\}$	CO3	4

Module -3

13	a)	Construct a PDA for the following language, $L=\{ a^i b^i c^k \mid i,k \geq 0 \}$	CO3	4
	b)	Construct the PDA for the language of balanced parentheses, L={ ( ),(( )),( )( ) ,( )( )( ),((( )))...}	CO3	5
14	a)	Suppose a programming language allows nested if blocks (e.g., if ... if ... endif ... endif). Design PDA transition steps to ensure that all if and endif pairs are matched.	CO3	3
	b)	Convert the following grammar to Greibach Normal Form	CO3	6

$$G = (\{A_1, A_2, A_3\}, \{a, b\}, R, A_1)$$

$$R = \{A_1 \rightarrow A_2A_3, A_2 \rightarrow A_3A_1|b, A_3 \rightarrow A_1A_2|a\}$$

Module -4

15	a)	Design a Turing machine to accept even length palindromes over {0,1}.	CO4	6
	b)	Define recursively enumerable language with an example.	CO4	3
16	a)	Prove that the Halting Problem is undecidable.	CO5	6
	b)	Explain the significance of the Church–Turing Thesis.	CO5	3

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