QP Code: SN23BTECH218 Reg. No | | | | | | | | | | | AY 23

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur (GIET University)

B. Tech (Fifth Semester - Regular) Examinations, November 2025

23BCSPC35003 – Theory of Computation

(CSE)

Time: 3 hrs Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer *ALL* questions		CO #	Blooms Level
a.	Given two languages $L_1 = \{a, b\}$ and $L_2 = \{aa, ab\}$, find the result of $L_1 \cdot L_2$ (concatenation of L_1 and L_2).	CO1	K1
b.	Write the regular expression for the language over $\Sigma = \{a, b\}$ containing an even number of a's followed by an odd number of b's2	CO2	K2
c.	Define and distinguish between leftmost derivation and rightmost derivation, with suitable examples.	CO3	K2
d.	Write the steps to remove unit production.	CO4	K2
e.	Differentiate between deterministic and non-deterministic PDA.	CO4	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions — Marks | CO # | Blooms Level

2. a. Design a DFA over **Σ** = {a, b} that recognize the language that has even number of a followed by odd number of b. Check the acceptance of string w= aaab. — 5 | CO1 | K3

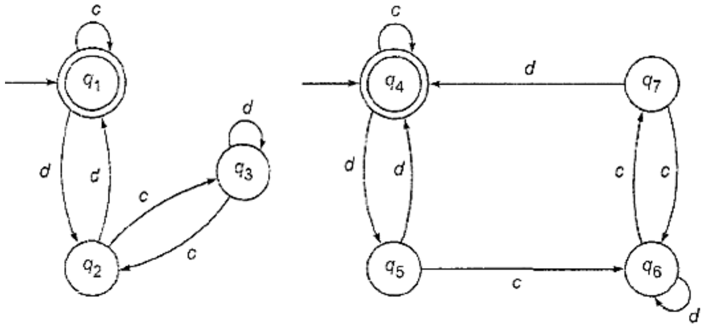
b. Find the Minimal automata for given FA — 5 | CO1 | K3

State/∑	A	b
-->q0	q0	q3
q1	q2	q5
q2	q3	q4
q3	q0	q5
q4	q0	q6
q5	q1	q4
Q6(f)	q1	q3

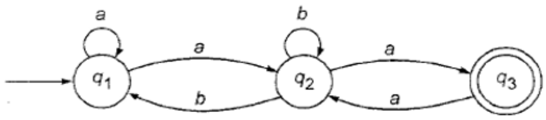
(OR)

c. Design a NFA over **Σ** = {a, b} where 3rd last symbol is 'a' and convert to corresponding DFA — 5 | CO1 | K3

d. Check whether these two given FA are equivalent or not — 5 | CO1 | K2



3.a. Find the RE from the given FA — 5 | CO2 | K3



b.	Prove that $a^n b^n$ is not regular language.	5	CO2	K2
	(OR)			
c.	Prove that regular language closed Kleen star.	5	CO2	K2
d.	Construct a FA from the RE (00+11) *(0+1)	5	CO2	K2
4.a.	Design a PDA for the language $a^n b^m c^n$ for n, m >=0. Check the acceptance the string w=abbc	5	CO3	K3
b.	Prove that CFL not closed under complement.	5	CO3	K3
	(OR)			
c.	Construct the grammar in GNF from equivalent the grammar S→AA|a, A→SS|b	5	CO3	K3
d.	Using CYK parsing algorithm check the string w=abbc is generated or not from the grammar S→AB, A→CC|a|c, B→BC|b, C→CB|BA|c	5	CO6	K2
5.a.	Design a Turing machine for the language $a^{n+1} b^n$ for n>=1	5	CO4	K3
b.	Describe PCP. Find post correspondence solution for [a,ab], [ba,aba], [b,aba], [bba,b]	5	CO4	K2
	(OR)			
c.	Design a Turing machine to find 2nd complement of a binary number.	5	CO4	K3
d.	Describe Variants Of Turing Machine.	5	CO4	K1
6.a.	Define Ackermann function. Find the value A(2,1).	5	CO5	K2
b.	Define NP Hard and NP complete class with examples.	5	CO5	K1
	(OR)			
c.	Describe Cantor and Godel numbering. Find the Godel number for a. 10011 b. 21011	5	CO5	K2
d.	Describe Recursive and Recursively Enumerable sets.	5	CO6	K1

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