

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



M.C.A. (Second Semester - Regular) Examinations, May - 2026

MCA252005 – Theory of Computation

Time: 3 hrs

Maximum: 60 Marks

(The figures in the right hand margin indicate marks)

PART – A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

- Construct a DFA over $\Sigma = (0, 1)$ even number of 0 and even number of 1.
- What are the operations of Regular Expression?
- Define null production.
- Define Grammar.
- Define recursive language.

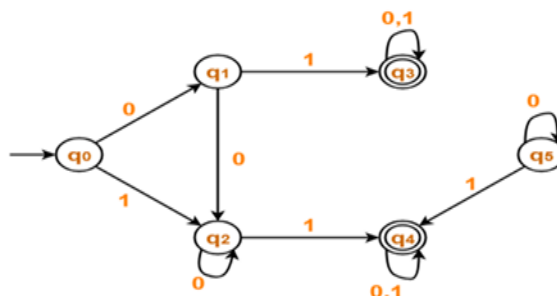
CO #	Blooms Level
CO1	K3
CO2	K1
CO3	K2
CO4	K1
CO5	K1

PART – B

(10 x 5 = 50 Marks)

Answer **ALL** questions

2. a. Minimize the given DFA-



Marks	CO #	Blooms Level
5	CO1	K3

- b. Construct a DFA over $\Sigma = (0, 1)$ Accept all the number which is divisible by 2
(OR)

5	CO1	K3
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- c. Design an NFA with $\Sigma = \{0, 1\}$ accepts all string in which the third symbol from the right end is always 0.

5	CO1	K3
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- d. Differentiate between NFA and DFA with example.

5	CO1	K2
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- 3.a. Design a NFA from given regular expression $1(1^*01^*01^*)^*$.

5	CO2	K3
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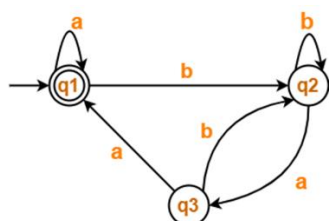
- b. Explain pumping lemma for regular expression with suitable example.

5	CO2	K2
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(OR)

- c. Find regular expression for the following DFA using Arden's Theorem-

5	CO2	K3
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- d. Construct the FA for regular expression $a(a + b)^*ab$.

5	CO2	K3
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- 4.a. Consider the grammar

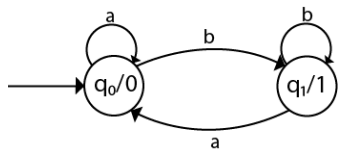
$S \rightarrow aAS|a$

$A \rightarrow SbA|SS|ba$

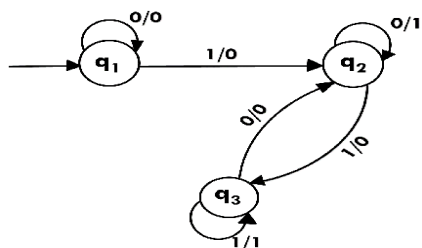
Derive left most derivation of string "aabbba" using given grammar.

5	CO3	K3
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- b. Explain ambiguous and unambiguous grammar with example. 5 CO3 K2
(OR)
- c. Convert following grammar into CNF 5 CO3 K3
 $S \rightarrow AC|\epsilon$, $A \rightarrow aS|a$, $C \rightarrow BC|aC|b$.
- d. Define Greibach Normal form in reference to CFG. 5 CO3 K2
- 5.a. Convert the following Moore machine into its equivalent Mealy machine. 5 CO4 K3



- b. Construct a push down automata for the language 5 CO4 K3
 $L = \{w \in (0,1)^* | n_0(w) = n_1(w)\}$.
(OR)
- c. What is post correspondence problem in Turing machine? 5 CO5 K2
- d. What is the difference between Turing machine and finite automata? 5 CO5 K2
- 6.a. Convert the following Mealy machine into equivalent Moore machine 5 CO4 K3



- b. What is PDA? How is it different from finite automata? 5 CO4 K1
(OR)
- c. Explain about Recursive enumerable language. 5 CO5 K2
- d. Describe the Turing machines with multiple tape, multiple track and storage in state. 5 CO5 K2

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