

**QUESTION BANK (UNIT WISE)**

**SUBJECTNAME : Formal Language and Automata Theory**

**COURSECODE :**

**YEAR :2024-2025**

**SEM : III-I**

**UNIT-I**

**PART-A**

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| **S.No.** | **Coverage** | **Questions** | **Marks** | **Bloom's Level** |
| 1 | UNIT-I | (a) Define NFA with example? | [1M] | L2 |
| 2 | UNIT-I | (b) What is Finite Automata with ε -Move. | [1M] | L1 |
| 3 | UNIT-I | (c) Explain any finite automata with output? | [1M] | L2 |
| 4 | UNIT-I | (d) Applications of FA? | [1M] | L3 |
| 5 | UNIT-I | (e) Define DFA with example? | [1M] | L2 |
| 6 | UNIT-I | (f)what is Kleene closure Language? | [1M] | L1 |
| 7 | UNIT-I | (g)Describe Mealy machine? | [1M] | L2 |
| 8 | UNIT-I | (h)Describe Moore machine? | [1M] | L2 |
| 9 | UNIT-I | (i) Explain any finite automata without output? | [1M] | L2 |
| 10 | UNIT-I | (j) Write different types of Automata? | [1M] | L1 |
| **PART-B** | | | | |
| **S.No.** | **Coverage** | **Questions** | **Marks** | **Bloom's Level** |
| 1 | UNIT-I | a) Consider the below finite automata and check the strings are accepted or not  (i) 1110 (ii) 0001 (iii) 1010  b) Define NFA. What are the differences between DFA & NFA | [5M]  [5M] | L3  L2 |
| 2 | UNIT-I | 1. Define Grammar. What are the tuples? 2. Convert NFA to DFA   IMG_256 | [5M]  [5M] | L2    L4 |
| 3 | UNIT-I | a) Convert NFA to DFAIMG_256  b) Explain briefly about DFA and NFA? | [5M]  [5M] | L2  L2 |
| 4 | UNIT-I | a) Convert NFA to DFANFA to DFA Conversion | Problem-02 | NFA  b) Obtain a DFA to accept strings of a’s and b’s having even number of a’s and b’s | [5M]  [5M] | L2  L4 |
| 5 | UNIT-I | 1. Obtain a DFA to accept strings of a’s and b’s starting with the string ab**.** 2. Convert NFA to DFA   NFA to DFA Conversion | Problem-03 | NFA | [5M]  [5M] | L4  L2 |
| 6 | UNIT-I | 1. Convert the following NFA with ε moves to DFA without ε moves.   C:\Users\Raju\Desktop\1.jpg | [10M] | L2 |
| 7 | UNIT-I | 1. Obtain DFAs to accept strings of a’s and b’s having exactly one a 2. Explain in detail about NFA and DFA. 3. Explain in detail about mealay and moore. | [5M]  [2.5M]  [2.5M] | L4  L2 |
| 8 | UNIT-I | Convert the following NFA with ε moves to DFA IMG_256 | [10M] | L2 |
| 9 | UNIT-I | Minimize the following finite automata.  C:\Users\Raju\Desktop\2.jpg | [10M] | L3 |
| 10 | UNIT-I | Define Moore machine? Construct Mealy machine corresponding to Moore machine? | [10M] | L2 |

**UNIT-II**

**PART-A**

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| **S.No.** | **Coverage** | **Questions** | **Marks** | **Bloom's Level** |
| 1 | UNIT-II | Draw Series FA with Episilon Moves. | [1M] | L1 |
| 2 | UNIT-II | Draw Parallel FA with Episilon Moves. | [1M] | L5 |
| 3 | UNIT-II | Draw Kleen Closure FA with Episilon Moves. | [1M] | L1 |
| 4 | UNIT-II | Write Arden’s Theorem | [1M] | L1 |
| 5 | UNIT-II | Write Closure Properties of Regular Languages | [1M] | L5 |
| 6 | UNIT-II | Write Decision Properties of Regular Languages | [1M] | L1 |
| 7 | UNIT-II | Write Applications of Pumping Lemma | [1M] | L1 |
| 8 | UNIT-II | Draw Series FA without Episilon Moves. | [1M] | L1 |
| 9 | UNIT-II | Draw Parallel FA without Episilon Moves. | [1M] | L1 |
| 10 | UNIT-II | Draw Kleen Closure FA without Episilon Moves. | [1M] | L1 |
| **PART-B** | | | | |
| **S.No.** | **Coverage** | **Questions** | **Marks** | **Bloom's**  **Level** |
| 1 | UNIT-II | Convert the following DFA to Regular Expression | [10M] | L3 |
| 2 | UNIT-II | Convert RE 1(0+1)\*0 into equivalent DFA | [10M] | L6 |
| 3 | UNIT-II | 1. List out the identities of Regular expression. 2. C:\Users\ADMIN\Desktop\1.pngWrite the process of equivalence two FA’s? Find whether the equivalence two FA’s or not | [5M]  [5M] | L5 |
| 4 | UNIT-II | 1. Construct an equivalent FA for the given regular expression (0+1)\*(00+11)(0+1)\* 2. List out the identities of Regular expression | [5M]  [5M] | L3 |
| 5 | UNIT-II | Construct an equivalent FA for the given regular expression (a+b)\*(ab+ba)(b+a)\* | [10M] | L1 |
| 6 | UNIT-II | Convert FA to Regular Expression  IMG_256 | [10M] | L3 |
| 7 | UNIT-II | Consider Two Different Automaton shown below in Figure 1.  IMG_256 | [10M] | L5 |
| 8 | UNIT-II | a) Construct an equivalent FA(with and without episilon movies) for given Regular Expression  1 (0 + 1)\* 0  b) Convert FA to Regular Expression      IMG_256 | [10M] | L5 |
| 9 | UNIT-II | 1. Explain in detail about Pumping lemma and Regular Language.   b) Construct an equivalent FA(with and without episilon movies) for given Regular Expression  1 (0 + 1)\* 0 | [10M] | L5 |
| 10 | UNIT-II | 1. Explain the algebraic laws of regular expressions 2. Convert FA to Regular Expression   IMG_256 | [10M] | L3 |

**UNIT-III**

**PART-A**

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| **S.No.** | **Coverage** | **Questions** | **Marks** | **Bloom's Level** |
| 1 | UNIT-III | Define Ambiguous grammar | [1M] | L1 |
| 2 | UNIT-III | Define Left recursion | [1M] | L1 |
| 3 | UNIT-III | Define Left factoring | [1M] | L1 |
| 4 | UNIT-III | Applications of CFG | [1M] | L5 |
| 5 | UNIT-III | How do we show the acceptance of CFL | [1M] | L1 |
| 6 | UNIT-III | Define Instantaneous description (ID) in PDA. | [1M] | L1 |
| 7 | UNIT-III | Define CFG? | [1M] | L1 |
| 8 | UNIT-III | What are Productions in CFG? | [1M] | L1 |
| 9 | UNIT-III | List the types of grammars in CNF | [1M] | L5 |
| 10 | UNIT-III | What is a Parse tree? | [1M] | L5 |
| **PART-B** | | | | |
| **S.No.** | **Coverage** | **Questions** | **Marks** | **Bloom's Level** |
| 1 | UNIT-III | Write the procedure and Eliminate left recursion from the following Grammar  EE+T/T  TT\*F/F  F(E)/id | [10M] | L5 |
| 2 | UNIT-III | Perform left factor from the grammar AabB/aB/cdg/cdeB/cdfB | [10M] | L2 |
| 3 | UNIT-III | Explain about derivation and parse trees? Construct the string 0100110 from the Leftmost and Rightmost derivation.  S0S/1AA  A0/1A/0B  B1/0BB | [10M] | L5 |
| 4 | UNIT-III | 1. Define Ambiguous grammar 2. Remove Left recursion from the grammar SSab/T   TTcd/F  FFa/G | [5M]  [5M] | L2 |
| 5 | UNIT-III | 1. Explain Left recursion and Left factoring 2. Perform left factor from the grammar AabB/aB/cdg/cdeB/cdfB | [5M]  [5M] | L3 |
| 6 | UNIT-III | 1. The following grammar should be converted to a PDA that supports the same language.   S → 0S1 | A  A → 1A0 | S | ε   1. Create a PDA for the provided CFG, and check if 0104 is supported by it.   S → 0BB  B → 0S | 1S | 0 | [5M]  [5M] | L1 |
| 7 | UNIT-III | Define derivation , types of derivation , Derivation tree & ambiguous grammar. Give example for each. | [10M] | L5 |
| 8 | UNIT-III | 1. Write a short note on application of context free grammar 2. Define Instantaneous description (ID) in PDA. | [5M]  [5M] | L5 |
| 9 | UNIT-III | 1. Define Instantaneous description (Tuples) in PDA. 2. Explain about the graphical notation of PDA | [5M]  [5M] | L3 |
| 10 | UNIT-III | Construct a CFG equivalent to the following PDA.  PDA={(p, q), (0, 1), δ, p, q, (Z, X)}, where p is initial state, q is final state.  δ is defined as δ(p,0,Z)=(p,XZ), δ(p,0,X)=(p,XX), δ(p,1,X)=(q,ϵ), δ(p,1,X)=(p,ϵ), δ(p,ϵ,Z)=(p,ϵ). | [10M] | L3 |

**UNIT-IV**

**PART-A**

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| **S.No.** | **Coverage** | **Questions** | **Marks** | **Bloom's Level** |
| 1 | UNIT-IV | Write three types of Production rules. | [1M] | L4 |
| 2 | UNIT-IV | Define Eliminating useless symbols | [1M] | L4 |
| 3 | UNIT-IV | Define Eliminating unit production | [1M] | L4 |
| 4 | UNIT-IV | Define CNF of a CFG. | [1M] | L4 |
| 5 | UNIT-IV | What is CNF and GNF form . | [1M] | L3 |
| 6 | UNIT-IV | Define Closure properties of CFL | [1M] | L4 |
| 7 | UNIT-IV | Define Decision properties of CFL | [1M] | L5 |
| 8 | UNIT-IV | Define greibach normal form convert the following grammar S -> Abb|a, A -> aaA|B, B -> bAb into the Greibach normal form. | [1M] | L3 |
| 9 | UNIT-IV | Define Instantaneous description(Tuples) of Turing Machine(TM). | [1M] | L1 |
| 10 | UNIT-IV | Define Turing Machine | [1M] | L1 |
| **PART-B** | | | | |
| **S.No.** | **Coverage** | **Questions** | **Marks** | **Bloom's Level** |
| 1 | UNIT-IV | Obtain the following grammar in CNF S->aA|a|B|C, A->aB|∈, B->aA C->cCD, D->abd | [10M] | L2 |
| 2 | UNIT-IV | convert CFG to CNF. Consider the given grammar G1:  *S → ASB A → aAS | a | ε  B → SbS | A | bb* | [10M] | L3 |
| 3 | UNIT-IV | Explain in detail about Chomsky hierarchy of Grammers | [10M] | L1 |
| 4 | UNIT-IV | Obtain the following grammar in GNF S->aA|a|B|C A->aB|∈ B->aA C->cCD D->abd | [10M] | L1 |
| 5 | UNIT-IV | 1. Define Instantaneous description(Tuples) of Turing Machine(TM). 2. What are the Applications of pumping Lemma | [10M] | L1 |
| 6 | UNIT-IV | Define CNF and GNF Convert the following grammar to CNF S∼S | [s⊃S]|p|q (S being the only variable. | [10M] | L2 |
| 7 | UNIT-IV | 1. Define Instantaneous description(Tuples) of Turing Machine(TM). 2. Explain Closure and Decision properties of CFL | [10M] | L2 |
| 8 | UNIT-IV | What are the Applications of pumping Lemma and Explain Closure and Decision properties of CFL | [10M] | L1 |
| 9 | UNIT-IV | Convert CFG to GNF  S → XA|BB  B → b|SB  X → b  A → a | [10M] | L1 |
| 10 | UNIT-IV | Eliminate useless symbols , Episilon and Unit Productions  S→aA|BCS→aA|BC  A→b|bBA→b|bB  B→aB|εB→aB|ε  C→aC|DC→aC|D  D→bD | [10M] | L1 |

**UNIT-V**

**PART-A**

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| **S.No.** | **Coverage** |  | **Marks** | **Bloom's Level** |
| 1 | UNIT-V | Define Turing Machine | [1M] | L2 |
| 2 | UNIT-V | Types of Turing Machine | [1M] | L2 |
| 3 | UNIT-V | Explain Programming techniques for Turning Machines | [1M] | L2 |
| 4 | UNIT-V | Define Recursive languages | [1M] | L1 |
| 5 | UNIT-V | Design a TM to recognize a string of the form anb2n | [1M] | L5 |
| 6 | UNIT-V | Define decidability ? | [1M] | L5 |
| 7 | UNIT-V | Define PCP | [1M] | L5 |
| 8 | UNIT-V | Write Other Undecicable Problems | [1M] | L1 |
| 9 | UNIT-V | Define undecidability ? | [1M] | L1 |
| 10 | UNIT-V | Define Universal Languages | [1M] | L1 |
| **PART-B** | | | | |
| **S.No.** | **Coverage** | **Questions** | **Marks** | **Bloom's Level** |
| 1 | UNIT-V | Draw block diagram for computational complexity problems and explain briefly. | [10M] | L1 |
| 2 | UNIT-V | Explain the various types of Turing machine | [10M] | L5 |
| 3 | UNIT-V | Define PCP. Explain Briefly about PCP. | [10M] | L5 |
| 4 | UNIT-V | Explain Universal Turing Machine | [10M] | L5 |
| 5 | UNIT-V | Explain Non Trivial property of recursively enumerable language is undecidable. | [10M] | L3 |
| 6 | UNIT-V | Explain Decidable and Undecidable problems. | [10M] | L5 |
| 7 | UNIT-V | 1. Explain Universal Turing Machine 2. Explain Instantaneous Description(Tuples) in TM | [5M]  [5M] | L5 |
| 8 | UNIT-V | Construct a Turing machine that recognizes the language anbncn | [10M] | L5 |
| 9 | UNIT-V | 1. Describe linear bounded automaton 2. Explain Instantaneous Description(Tuples) in TM | [5M]  [5M] | L1 |
| 10 | UNIT-V | Explain Relationship between P and NP Class briefly | [5M]  [5M] | L5 |