

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Bachelor of Technology (Computer Engineering) SEMESTER - 5 Winter 2025 (Regular)

Course :Bachelor of Technology (Computer Engineering) Branch : Engineering and Technology

Semester : SEMESTER - 5

Subject Code & Name: BTCOC502 - THEORY OF COMPUTATIONS

Time : 3 Hours]

[Total Marks : 60

Instructions to the Students:

1. Each question carries 12 marks.
2. Question No. 1 will be compulsory and include objective-type questions.
3. Candidates are required to attempt any four questions from Question No. 2 to Question No.6
4. Use of non-programmable scientific calculators is allowed.
5. Assume suitable data wherever necessary and mention it clearly.

Q1. Objective type questions. (Compulsory Question)

12

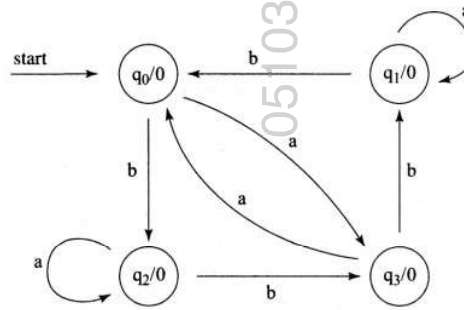
- 1 Subset Construction method used for
 - a) Conversion of NFA to DFA
 - b) DFA minimization
 - c) Eliminating Null references
 - d) ϵ -NFA to NFA
- 2 Every NFA accepts
 - a) String
 - b) Regular language
 - c) Function
 - d) Context-free language
- 3 In Mealy machine, the output depends upon?
 - a) State
 - b) Previous State
 - c) State and Input
 - d) Only Input
- 4 Production Rule: $aAb \rightarrow ab$ belongs to which of the following category?
 - a) Regular Language
 - b) Context free Language
 - c) Context Sensitive Language
 - d) Recursively Enumerable Language
- 5 Which of the following statement is correct?
 - a) All Regular grammar are context free but not vice versa
 - b) All context free grammar are regular grammar but not vice versa
 - c) Regular grammar and context free grammar are the same entity
 - d) None of the mentioned
- 6 Which among the following cannot be accepted by a regular grammar?
 - a) L is a set of numbers divisible by 2
 - b) L is a set of binary complement
 - c) L is a set of string with odd number of 0
 - d) L is a set of $0^n 1^n$
- 7 Push down automata accepts _____ languages.
 - a) Type 3
 - b) Type 2
 - c) Type 1
 - d) Type 0
- 8 A regular language over an alphabet a is one that can be obtained from
 - a) union
 - b) concatenation
 - c) kleene
 - d) All of the mentioned
- 9 Which among the following is equivalent to the given regular expression?
 01^*+1
 - a) $(01)^*+1$
 - b) $0((1)^*+1)$
 - c) $(0(1)^*)+1$
 - d) $((0^*1)1^*)$
- 10 A Turing machine that is able to simulate other Turing machines is
 - a) Nested Turing machines
 - b) Universal Turing machine
 - c) Counter machine
 - d) None of the mentioned
- 11 Which of the functions are not performed by the Turing machine after reading a symbol?
 - a) writes the symbol
 - b) moves the tape one cell left/right
 - c) proceeds with next instruction or halts
 - d) none of the mentioned
- 12 A grammar with more than one parse tree is called
 - a) Unambiguous
 - b) Ambiguous
 - c) Regular
 - d) None of the mentioned

Q2. Solve the following.

- A) Form the string set for the following regular expressions. 6
 i) $(a+b)^*aa$ ii) a^*b^* iii) $a+b+c$
- B) What are the elements of Deterministic Finite Automaton? Design Deterministic Finite Automaton that accepts odd number of 1's over alphabet $\{1\}$. 6

Q3. Solve the following.

- A) Design an e-Non Deterministic Finite Automaton to accept set of all strings over alphabet $\{0,1\}$, starting with 00 and ending with either 0 or 1. 6
- B) Consider following Moore machine. What will be the output string if input string is $S = bababbb$. 6



Q4. Solve Any Two of the following.

- A) Prove that the grammar $S \rightarrow aSbS \mid bSaS \mid \epsilon$ is an ambiguous grammar. 6
- B) Explain Chomsky classification of grammars. 6
- C) Obtain the left most and the rightmost derivations and parse tree for the grammar, whose production rules are: 6
 $E \rightarrow E + E$
 $E \rightarrow E * E$
 $E \rightarrow id$
 and given the string for derivation is $w = id + id * id$.

Q5. Solve Any Two of the following.

- A) Find the reduced grammar equivalent to the CFG, where $V = \{A, B, C, S\}$, $T = \{a, b\}$, P is 6
 $S \rightarrow AB \mid CA$
 $B \rightarrow BC \mid AB$
 $A \rightarrow a$
 $C \rightarrow aB \mid b$
- B) Explain the functions of each component of Pushdown Automaton with the help of neat diagram. 6
- C) Explain with the help of an example, how Pushdown Automaton is represented with the help of transition diagram and transition table. 6

Q6. Solve Any Two of the following.

- A) Design a TM which accepts all strings of the form $a^n b^n$ for $n \geq 1$. Show that the string $aabb$ is accepted by this Turing machine. 6
- B) What is Church Turing thesis? 6
- C) Explain the following : (i) Universal Turing Machine (ii) Non deterministic Turing Machine (iii) Multihead Turing Machine 6

*** End ***