BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – B.Tech.(CSE)-2024/B.Tech.(CSE)-AIML-2024/B.Tech.(CSE)-DS-2024/B.Tech.(CSE)-AIR-2024
Course Name – Formal Language and Automata Theory
Course Code - BTS40108/BTA40108/BTD40108/BTR40108
(Semester IV)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Choose the Number of states require to accept string ends with 101

a) 3 b) 4
c) 2 d) 5

(ii) Given the language L = {ab, aa, baa}, predict the following strings are in L*. 1) abaabaaabaa 2) aaaabaaaa 3) baaaaabaaaab 4) baaaaabaa

a) 1, 2 and 3 b) 2, 3 and 4
c) 1, 2 and 4 d) 1, 3 and 4

(iii) Determine that DFA recognize a palindrome number correct or not.

a) Yes b) No
c) Yes, with input alphabet as a* d) cann't be determined

(iv) The transition function in a finite automaton is typically represented as:

a) $\delta: Q \times \Sigma \rightarrow Q$ b) $\delta: Q \times \Sigma \rightarrow P(Q)$
c) both a and b d) none

(v) Choose the number of final states require to accept Φ in minimal finite automata.

a) 1 b) 2
c) 3 d) None of the mentioned

(vi) Determine A DFA that cannot be represented in the following format.

a) Transition graph b) Transition Table
c) C code d) None of the mentioned

(vii) State the purpose of the transition function in a finite automaton.

a) To specify the start state of the automaton. b) To define the alphabet of the automaton.
c) To map a state and an input symbol to a set of states. d) To determine the set of accept states.

(viii) The basic limitation of finite automata is observed as

a) It can't remember arbitrary large amount of information
b) It sometimes recognizes grammar that are not regular.
c) It sometimes fails to recognize regular grammar.
d) All of the mentioned

(ix) Finite automata describe the requirement of minimum _____ number of stacks.

a) 1
b) 0
c) 2
d) None of the mentioned

(x) Define the condition are 2 finite machines equivalent.

a) Same number of transitions
b) Same number of states
c) Same number of states as well as transitions
d) Both are final states

(xi) Recognize the options which support the given statement? Statement: A regular expression could be a fixed word or describe something like more general.

a) This flexibility makes Regular expression invaluable
b) This flexibility makes the Regular expression unvaluable
c) This flexibility makes Regular expression invaluable and unvaluable
d) None of the mentioned

(xii) Estimate which of the following not an example Bounded Information?

a) fan switch outputs {on, off}
b) electricity meter reading
c) colour of the traffic light at the moment
d) None of the mentioned

(xiii) Select which of the following is true?

a) Every subset of a regular set is regular
b) Every finite subset of non-regular set is regular
c) The union of two non-regular set is not regular
d) Infinite union of finite set is regular

(xiv) In a deterministic finite automaton (DFA), how many transitions does each state have for a given input symbol?

a) 0
b) 1
c) multiple
d) none

(xv) The number of Tuples that define DFA are

a) 3
b) 4
c) 5
d) 6

Group-B

(Short Answer Type Questions) 3 x 5=15

2. List out the identities of Regular expression. (3)
3. Illustrate the FA from given regular expression 10 + (0 + 11)0* 1. (3)
4. Explain the working and formal defination of Push Down Automata utilizing a stack. (3)
5. Explain the key differences between Mealy and Moore machines. In what scenarios would you prefer to use each type of finite state machine? Compare and contrast their advantages and disadvantages. (3)
6. Explain the process for converting PDA into an equivalent CFG. (3)

OR

Explain linear grammar with example. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Define epsilon closure of a state with example and describe its significance in Automata. (5)
8. Let G be the grammar S →Ab|ba A →a|aS|aAA B →b|bS|aBB For the string aaabbabbba establish the leftmost and rightmost derivation tree. (5)

9. Convert the given Grammar to GNF: S→CA|BB, B→b|SB, C→b, A→a (5)
10. Estimate a PDA that accepts the language L over {0, 1} by empty stack which accepts all the string of 0s and 1s in which a number of 0s are twice of number of 1s. (5)
11. Conclude the significance of converting an NFA to a DFA in the context of computational theory. Explain this conversion aid in simplifying the analysis of regular languages. Provide examples to support your explanation. (5)
12. Estimate the CFG after elimination of left recursion from the following Grammar. E→E+T|T, T→T*F|F, F→(E)|id (5)

OR

Show a by a diagram the regular language for each of the following language: L={w Ɛ {a,b}*:w does not end in aa} (5)

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