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BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Tech.(CSE)-AIML-2021/B.Tech.(CSE)-DS-2021/B.Tech.(CSE)-AIML-2022/B.Tech.(CSE)-DS-2022/B.Tech.(CSE)-AIML-2023/B.Tech.(CSE)-DS-2023/B.Tech. (CSE)-2023
Course Name – Formal Language & Automata Theory
Course Code - PCC-CSM404/PCC-CSD404/PCC-CSG404
(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) Extended transition function is interpreted as.

a) $Q * \Sigma^* \to Q$ b) $Q * \Sigma \to Q$

c) $Q^* * \Sigma^* \to \Sigma$ d) $Q * \Sigma \to \Sigma$

(ii) Judge among the following that is correct proposition. Statement 1: Non-determinism is a generalization of Determinism. Statement 2: Every DFA is automatically an NFA

a) Statement 1 is correct because Statement 2 is correct   b) Statement 2 is correct because Statement 1 is correct

c) Statement 2 is false and Statement 1 is false   d) Statement 1 is false because Statement 2 is false

(iii) Judge among the following pair of regular expression that are not equivalent.

a) 1(01)* and (10)*1   b) x(xx)* and (xx)*x

c) (ab)* and a*b*   d) x+ and x*x+

(iv) The complement of a language will only be defined when and only when the _____ over the language is defined.

a) String   b) Word

c) Alphabet   d) Grammar

(v) Identify that Arden's theorem is true for

a) More than one initial states   b) Null transitions

c) Non-null transitions   d) None of these

(vi) δ explains the best:

a) transition function   b) translation function

c) equivalence   d) Kleene operation is performed on the set

(vii) Determine the following those statements are correct for a concept called inherent ambiguity in CFL.

a) Every CFG for L is ambiguous
b) Every CFG for L is unambiguous
c) Every CFG is also regular
d) None of the mentioned

(viii) Choose the order those are the children of any node ordered.

a) From the left
b) From the right
c) Arbitrarily
d) None of the mentioned

(ix) If w belongs to L(G), for some CFG, then w has a parse tree, which tell us the _____ structure of w. Determine the correct option.

a) semantic
b) syntactic
c) lexical
d) all of the mentioned

(x) In non-deterministic PDA, there are more than one out going edges from the following selected states?

a) READ or POP
b) START or READ
c) POP or REJECT
d) PUSH or POP

(xi) Discover the trueness for the given statement? Statement: If there are strings R and T in a language L so that R is prefix of T and R is not equivalent to T.

a) No DPDA can accept L by empty stack
b) DPDA can accept L by an empty stack
c) L is regular
d) None of the mentioned

(xii) With reference of a DPDA, Explain among the following do we perform from the start state with an empty stack.

a) process the whole string
b) end in final state
c) end with an empty stack
d) all of the mentioned

(xiii) The ability for a system of instructions to simulate a Turing Machine is defined as _____

a) Turing Completeness
b) Simulation
c) Turing Halting
d) None of the mentioned

(xiv) Select which of the following a turing machine does not consist of?

a) input tape
b) head
c) state register
d) None of the mentioned

(xv) State which of the following does not obey pumping lemma for context free languages?

a) Finite languages
b) Context free languages
c) Unrestricted languages
d) None of the mentioned

Group-B
(Short Answer Type Questions)   3 x 5=15

2. Describe the Halting Problem of Turing Machine   (3)
3. Examine the given grammar G is ambiguous or not.   (3)

   S → aSb | SS
   S → ε

4. Construct the transition diagram of a FA which accepts all strings of 1's and 0's in which both (3) the number of 0's and 1's are even.
5. State and Prove Arden's Theorem   (3)
6. Convert the given CFG to CNF. Consider the given grammar G1:   (3)
   S → a | aA | B
   A → aBB | ε

   B → Aa | b

OR

Illustrate the equivalent CFG for the Expression: (a+b)*aa(a+b)*   (3)

Group-C
(Long Answer Type Questions)   5 x 6=30

7. Prove that the given language L=a^nb^n (where n>0)is not regular   (5)
8. Show that L - {ww| w ∈ {0,1}* } is not context free   (5)
9. Compare and contrast the advantages and disadvantages of Mealy and Moore machines in   (5)
    various applications.
10. Define Mealy Machine and it's output characteristics.   (5)
11. Estimate the PDA that recognize the set of all strings over 0,1 that contains at least one 1   (5)
12. Construct a turing machine which accepts the language of "aba" over Σ = {a, b}.   (5)

OR

Construct a TM for the language L = $\{0^n1^n2^n\}$ where n≥1   (5)

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