BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – B.Tech.(CSE)-AIML-2021/B.Tech.(CSE)-DS-2021/B.Tech.(CSE)-AIML-2022/B.Tech.(CSE)-DS-2022
Course Name – Formal Language & Automata Theory
Course Code - PCC-CSM404/PCC-CSD404
(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)   Given the language L = {ab, aa, baa}, predict which of 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

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

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

(iii)   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

(iv)   The minimum number of states required to recognize an octal number divisible by 3 can be computed as

a) 1
b) 3
c) 5
d) 7

(v)   Observe which of the expression is appropriate? For production p: a->b where a∈V and b∈_____

a) V
b) S
c) $(V+\Sigma)^*$
d) V+ Σ

(vi)   Explain which of the following is not a regular expression?

a) [(a+b)*(aa+bb)]*
b) [(0+1)(0b+a1)*(a+b)]*
c) (01+11+10)*
d) (1+2+0)*(1+2)*

(vii)   Determine which of the following statement is false in context of tree terminology?

a) Root with no children is called a leaf
b) A node can have three children
c) Root has no parent
d) Trees are collection of nodes, with a parent child relationship

(viii)   Judge which of the following 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

(ix)   A symbol X is called to be useful if and only if it explains to be:

a) generating
b) reachable
c) both generating and reachable
d) none of the mentioned

(x)   The transition a Push down automaton makes is additionally dependent upon the____. State the correct option.

a) stack
b) input tape

c) terminals
d) none of the mentioned

(xi) Finite-state acceptors for the nested words can be defined as:

a) nested word automata
b) push down automata
c) ndfa
d) none of the mentioned

(xii) A push down automata is explained to be _____ if it has atmost one transition around all configurations.

a) Finite
b) Non Reqular
c) Non Deterministic
d) Deterministic

(xiii) A turing machine that is able to simulate other turing machines is defined as:

a) Nested Turing machines
b) Universal Turing machine
c) Counter machine
d) None of the mentioned

(xiv) There exists a language L. We define a string w such that w∈L and w=xyz and |w| >=n for some constant integer n. What can be the maximum length of the substring xy i.e. |xy|<=?

a) n
b) |y}
c) |x|
d) None of the mentioned

(xv) State among the following gives a positive result to the pumping lemma restrictions and requirements?

a) {aibici|i>=0}
b) {0i1i|i>=0}
c) {ss|s∈{a,b}*}
d) None of the mentioned

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

2. Explain with an example of an ambiguous CFG. (3)
3. Establish a DFA to accept strings of a's and b's starting with the string ab (3)
4. Explain the equivalence of CFL and PDA. (3)
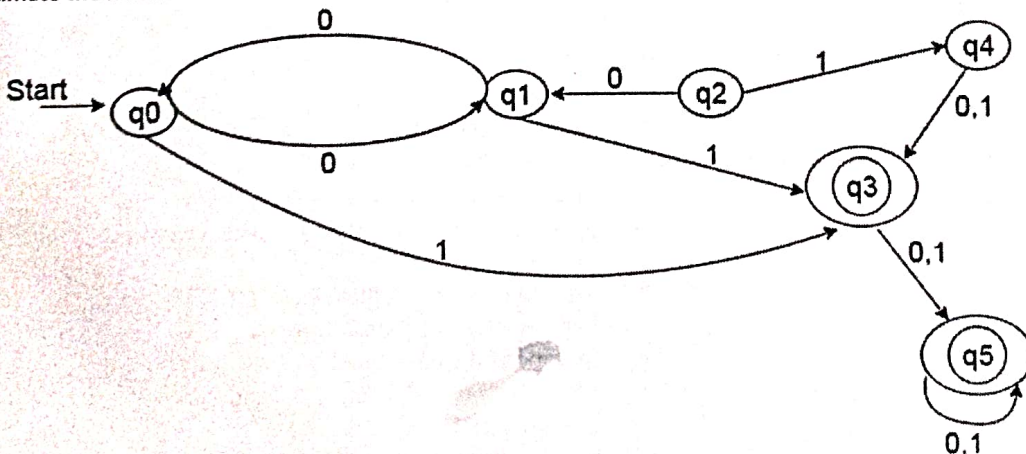5. Illustrate the given NFA into its equivalent DFA. (3)
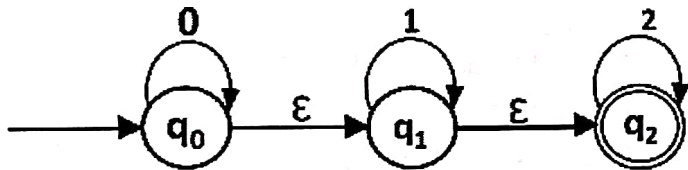
6. Justify the use of pumping lemma for regular sets with an example. (3)

OR

Express the use of recursive and recursive enumerable languages. (3)

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

7. Estimate the minimized DFA. (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. Construct TM for the language L ={0^n1^n} where n>=1.   (5)

11. Distinguish between three types of Finite State Machines.   (5)
12. Estimate the following Mealy machine into equivalent Moore machine.   (5)
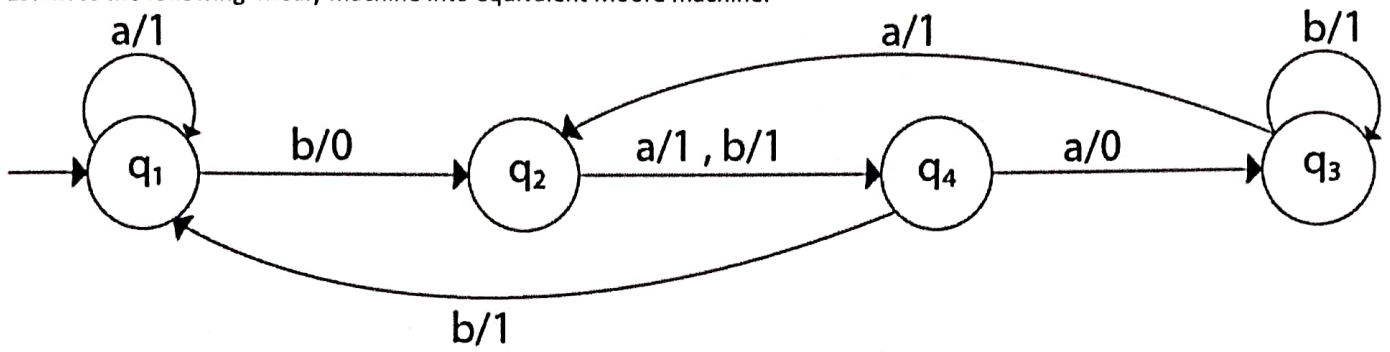
OR

Estimate the regular expression for the given DFA   (5)

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