

Date:2-03-2022

Registration number:

ST. JOSEPH’S COLLEGE (AUTONOMOUS), BENGALURU-27

Msc Computer Science - I SEMESTER

SEMESTER EXAMINATION: OCTOBER 2021

(Examination conducted in January-March 2021)

**CS 7221 - Theory of Computation**

Time- 2 ½ hrs Max Marks-70

This question paper contains three parts and four printed pages

**Part A**

**Answer all the following questions (15\*1=15)**

1. The set of all strings over the alphabet S = {a, b} (including e) is denoted by
2. (a+b)\*
3. (a+b)+
4. a+b+
5. a\*b\*
6. Finite automata is defined as
7. Abstract Machine
8. Real machine
9. Imaginary Machine
10. None of the following
11. If L1 and L2 are context free language and R a regular set, then which one of the languages below is not necessarily a context free language**?**
12. L1L2
13. L1∩ L2
14. L1 ∩ R
15. L1∪ L2
16. All the regular languages can have one or more of the following descriptions:  
    i) DFA ii) NFA iii) e-NFA iv) Regular Expressions  
    Which of the following are correct?  
    a. i, ii, iv  
    b. i, ii, iii  
    c. i, iv  
    d. i, ii, iii, iv
17. Which among these is a UNIT production?  
    a. A🡪a  
    b. A🡪za  
    c. A🡪B  
    d. A🡪Ba
18. Which of the following is an application of Finite Automata?  
    a) Compiler Design  
    b) Grammar Parsers  
    c) Text Search  
    d) All of the mentioned
19. The finite automata is called NFA when there exists \_\_\_\_\_\_ for a specific input from current state to next state.
20. Single path
21. Multiple paths
22. Only two paths
23. None
24. The transition a Push down automaton makes is additionally dependent upon the:  
    a. stack  
    b. input tape  
    c. terminals  
    d. none of the mentioned
25. A language accepted by Deterministic Push down automata is closed under which of the following?  
    a. Complement  
    b. Union  
    c. All of the mentioned  
    d. None of the mentioned
26. An ambiguous grammar can be obtained through  
    a. Only Leftmost derivative  
    b. Only Rightmost derivative  
    c. Both  
    d. None
27. The language accepted by a Push down Automata:
28. Type 0
29. Type 1
30. Type 2
31. Type 3
32. Which of the following can accept even palindrome over {a,b}  
    a. Push down Automata  
    b. Turing machine  
    c. NDFA  
    d. All of the mentioned
33. Regular expression to consider strings of any number of A’s and B’s ending with AB is  
    a. (A+B)\*  
    b. AB  
    c. AB(A+B)\*  
    d. (A+B)\*AB
34. Consider a grammar:   G = ({x, y), {s, x, y}, p, s)  
        where elements of parse:  
        S--> x y  
        S -->y x  
         x--> x z  
         x--> x  
         y--> y  
         z--> z

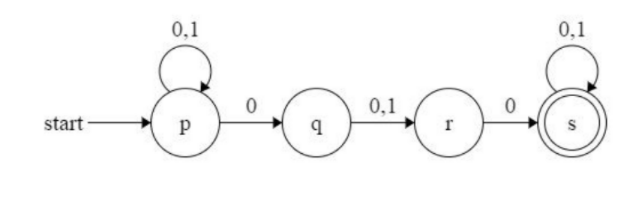
The language L generated by G most accurately is called

1. Chomsky type 0
2. Chomsky type 1
3. Chomsky type 2
4. Chomsky type 3
5. Identify the Left Recursive Grammar among this  
   a. A->Ba/T  
   b. A->a  
   c. A->epsilon  
   d. all of the above

**PART B**

**Answer all the five questions. In each question answer either the first or the second part (5\*5=25)**

1. a. Convert the given NFA to its equivalent DFA



OR

b. Write a DFA to accept strings of a’s and b’s with even number of a’s and b’s.

1. a. Draw a DFA from the following regular expression (0+1)\*(00+11) (0+1)\*

OR

b. Define regular expression and also write the regular expressions for the following

languages:

i) L= { w ϵ { a,b } \* | w has exactly one pair of consecutive a's }.

ii) Set of all strings not ending in substring 'ab' over Σ = { a,b }.

1. a. Eliminate Left Recursion from the given Grammar

A->Aa/B/C

T->T+B/T\*X/L/M

OR

b. Convert the following grammar into GNF

S 🡪 AB1 | 0

A 🡪 00A | B

B 🡪 1A1

B 🡪 CA | b

C 🡪 AB | a

1. a. Explain Instantaneous Description for a corresponding PDA with an Example.

OR

b. What is the general purpose of the STACK in PDA. Explain any transitions of a PDA with respect to the changes in the STACK.

1. a. Obtain a Turing Machine to accept the language L={0n1n | n>=1}

OR

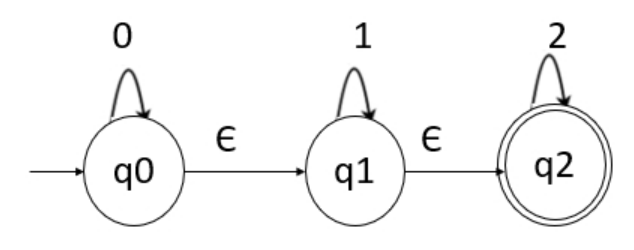
b. Given a string w, design a Turing Machine that generates the string ww where w Ɛ a+

**PART C**

**Answer any three of the following questions (3\*10=30)**

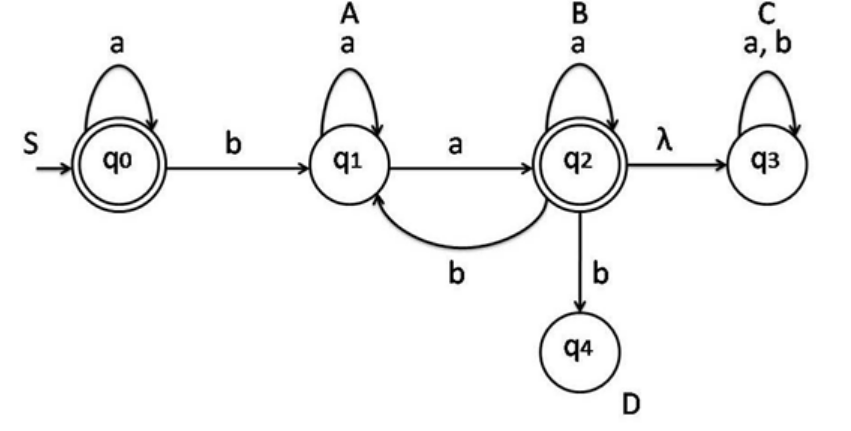
1. a. How to convert NFA with epsilon to without epsilon?

b. Convert the given NFA with epsilon to NFA without epsilon. [4+6]



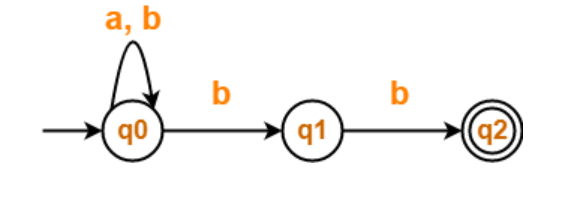
1. a. What is context free grammar? [3+7]

b. Construct a regular grammar for the following FA.



1. a. What is a Finite Automata? [2+8]

b. Convert the following Non-Deterministic Finite Automata (NFA) to Deterministic Finite Automata (DFA).



1. a. What is Ambiguous grammar?

b. Show that the following grammar is ambiguous.

S🡪 aSbS

S🡪 bSaS

S🡪 Ɛ

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