



**PRESIDENCY UNIVERSITY  
BENGALURU**

**SET - A**

**SCHOOL OF ENGINEERING  
END TERM EXAMINATION - JAN 2023**

**Semester :** Semester III - 2021

**Course Code :** CSE2018

**Course Name :** Sem III - CSE2018 - Theory of Computation

**Program :** B.Tech. CSE/ISE/IST/ISD/ISR

**Date :** 19-JAN-2023

**Time :** 1.00PM - 4.00PM

**Max Marks :** 100

**Weightage :** 50%

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**Instructions:**

- (i) Read all questions carefully and answer accordingly.*
  - (ii) Question paper consists of 3 parts.*
  - (iii) Scientific and non-programmable calculator are permitted.*
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**PART A**

**ANSWER ALL THE TEN QUESTIONS**

**10 X 2 = 20M**

1. Mention two applications of PDA. (CO1) [Knowledge]
2. Briefly describe the reversal and length of the string with an example (CO1) [Knowledge]
3. Construct NFA for  $L = \{ \text{all strings with prefix } ab \}$  over  $\{a,b\}$  (CO2) [Knowledge]
4. Define Epsilon NFA. (CO2) [Knowledge]
5. Give the techniques of representation for a derivation tree. (CO3) [Knowledge]
6. Give Regular Expressions for the following Languages:
  - a) all strings ending in b
  - b) all strings of even Length(CO3) [Knowledge]
7. Mention the language that is accepted by PDA and FA. Give an example for each. (CO4) [Knowledge]
8. The transition in a Push down automaton makes is additionally dependent upon the: (CO4) [Knowledge]
9. Mention two major differences between TM and PDA. (CO5) [Knowledge]
10. Mention the transitions that takes place for every time step in TM. (CO5) [Knowledge]

## PART B

ANSWER ALL THE FIVE QUESTIONS

5 X 10 = 50M

11. Convert given NFA to its equivalent DFA

Present State	Next State	
	0	1
->A	{B,D}	{F}
B	{C}	{C,B}
*C	{A,C}	{C}
D	{C}	{C,D}
E	{B,E}	{F}

(CO2) [Comprehension]

12. Construct a Turing machine for  $L = \{1^n 2^n, n \geq 1\}$

Write Transition diagram, Transition table, TM tuples, string acceptance and rejection.

(CO2) [Comprehension]

13. a. Define the recursive Regular Expression  
b. Write regular expressions for the following languages on {a, b}:  
(a) All strings ending in ba.  
(b) All strings not ending in aa  
(c) All strings containing an odd number of a's.

(CO3) [Comprehension]

14. a) Consider the following grammar

$S \rightarrow bB/Aa$

$A \rightarrow b/ bS/ aAA$

$B \rightarrow a/ aS/ bBB$

Find: Leftmost and right most derivation For string bbaababa and Also find derivation tree

b) Given:  $L(G) = \{a^n b^n : n \text{ is odd}\}$ . Find CFG.

(CO3) [Comprehension]

15. Consider the dfa with initial state  $q_0$ , final state  $q_2$  and

[5M]

$\delta(q_0, a) = q_2$   $\delta(q_0, b) = q_2$

$\delta(q_1, a) = q_2$   $\delta(q_1, b) = q_2$

$\delta(q_2, a) = q_3$   $\delta(q_2, b) = q_3$

$\delta(q_3, a) = q_3$   $\delta(q_3, b) = q_1$

Find a minimal equivalent dfa.

(CO2,CO5) [Comprehension]

## PART C

ANSWER ALL THE TWO QUESTIONS

2 X 15 = 30M

16. What are the three stack operations in PDA? Give example

(CO4) [Application]

17. Design a Turing Machine that accepts  $L = \{a^n b^n c^n : n \geq 1\}$

(CO5) [Application]