

06 FEB 2023

Reg. No.

Question Paper Code

11688

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Third Semester

Computer Science and Business Systems

20CBPC301 - FORMAL LANGUAGE AND AUTOMATA THEORY

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

**PART - A (10 × 2 = 20 Marks)**

Answer ALL Questions

- |   | <i>Marks,</i><br><i>K-Level, CO</i> |
|---|-------------------------------------|
| 1. Relate regular grammars and regular expressions.   | 2, K1, CO1                          |
| 2. Identify the regular expression for the production $S \rightarrow aS, S \rightarrow a$ . | 2, K2, CO1                          |
| 3. Construct a DFA which accepts all strings end with 0 over alphabet $\Sigma = \{0,1\}$ .  | 2, K3, CO2                          |
| 4. Write the applications of Finite Automata.   | 2, K1, CO2                          |
| 5. When do you say a grammar is ambiguous?  | 2, K1, CO3                          |
| 6. State the difference between finite automata and Pushdown Automata.                      | 2, K1, CO3                          |
| 7. List the components of Turing Machine.   | 2, K1, CO4                          |
| 8. State Recursive Enumerable Language.   | 2, K1, CO4                          |
| 9. What is universal Language $L_u$ ?   | 2, K1, CO5                          |
| 10. Write about decidable and recognizable language.  | 2, K1, CO5                          |

**PART - B (5 × 13 = 65 Marks)**

Answer ALL Questions

11. a) (i) Explain Chomsky Hierarchy of Languages in detail. 9, K1, CO1  
(ii) Write the regular expression for the  $L = \{w \in \{0,1\}^* \mid w \text{ has no pair of consecutive zeros.}\}$  4, K2, CO1
- OR**
- b) Explain the closure properties of regular languages. 13, K1, CO1
12. a) Convert the regular expression  $(0+1)^*(011)$  from NFA to DFA. . 13, K3, CO2  
Explain step by step.

**OR**

- b) (i) Minimize the following DFA 7, K2, CO2

$\delta$ (Transition)	a	b
$\rightarrow P_0$	P0	P1
P1	P2	P1
P2	P3	P1
*P3	P3	P4
*P4	P5	P4
*P5	P3	P4

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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(ii) Write the Kleen's closure properties of Regular Language.

6,K1,CO2

13. a) Consider the grammar

13,K3,CO3

$S \rightarrow AS|\xi$

$A \rightarrow aa|ab|ba|bb$

Construct LMD & RMD for the following grammar which consists of all strings of even length.

(i) aabbba

(ii) baabab

(iii) aaabbb

**OR**

b) (i) Derive the string 'aababa' for the following CFG

8,K3,CO3

$S \rightarrow aS X/b$

$X \rightarrow Xb/a$

(ii) Define derivation tree. Explain its uses with an example

5,K1,CO3

14. a) Produce a Turing Machine to accept the language  $L = \{a^n b^n / n > 1\}$ . Draw the transition diagram. Also specify the instantaneous description to trace the string aabb.

13,K3,CO4

**OR**

b) (i) Prove that two recursive languages  $L_1$  and  $L_2$  their union and intersection are recursive.

5,K2,CO4

(ii) Discuss the types of Turing Machines

8,K2,CO4

15. a) (i) Write the classes and definition of P and NP Problems.

7,K3,CO5

(ii) Explain Cook's theorem.

6,K3,CO5

**OR**

b) (i) Explain undecidability of PCP.

7,K3,CO5

(ii) Explain Rice's Theorem.

6,K3,CO5

**PART - C (1 × 15 = 15 Marks)**

16. a) Construct a Pushdown Automata for the following language  $L = \{0^n 1^m 2^m 3^n \mid n \geq 1, m \geq 1\}$ . Explain with steps.

15,K3,CO3

**OR**

b) Minimize the following DFA using Myhill-Nerode Theorem

15,K3,CO2

