



# GOVERNMENT COLLEGE OF ENGINEERING, JALGAON

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Name of Examination : **Winter 2020** - (Preview)

Course Code & Course Name : **CO303U - Formal Language and Automata Theory**

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Maximum Marks : **60**

Duration : **3 Hrs**

[Edit](#) [Print](#) [View Answer Key](#) [Close](#) **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

1. All questions are compulsory.
2. Illustrate your answer with suitable figures/sketches wherever necessary.
3. Assume suitable additional data; if required.
4. Figures to the right indicate full marks.

1) Solve any two sub-questions.

a.) Construct a minimum state automata equivalent to the finite automata describe by the following table where  $q_0$  is initial and  $q_2$  is final state: [6]

State / $\Sigma$	0	1
$\Rightarrow q_0$	$q_1$	$q_5$
$q_1$	$q_6$	$q_2$
$q_2$	$q_0$	$q_2$
$q_3$	$q_2$	$q_6$
$q_4$	$q_7$	$q_5$
$q_5$	$q_2$	$q_6$
$q_6$	$q_6$	$q_4$
$q_7$	$q_6$	$q_2$

b.) Define DFA and NFA with suitable example. [6]

c.) Construct a Mealy Machine which is equivalent to the Moore Machine given by following table: [6]

Present State	Next State		Output
	a=0	a=1	
$\Rightarrow q_0$	$q_3$	$q_1$	0
$q_1$	$q_1$	$q_2$	1
$q_2$	$q_2$	$q_3$	0
$q_3$	$q_3$	$q_0$	0

2) Solve any two sub-questions.

a.) Prove  $(a+b)^* = a^*(ba)^*$ . [6]

b.) Prove  $(1+00^*1) + (1+00^*1)(0+10^*1)^*(0+10^*1) = 0^*1(0+10^*1)^*$ . [6]

c.) Show that  $L = \{0^i 1^i \mid i \geq 1\}$  is not regular. [6]

3) Solve any two sub-questions.

a.) Let G be the grammar  $S \Rightarrow 0B|1A, A \Rightarrow 0|0S|1AA, B \Rightarrow 1|1S|0BB$ . For the string 00110101, find: [6]

- (i) The leftmost derivation
- (ii) The rightmost derivation
- (iii) The derivation tree.

b.) Construct a reduced grammar equivalent to the grammar [6]

$S \Rightarrow aAa$   
 $A \Rightarrow Sb|bCC|DaA$   
 $C \Rightarrow abb|DD$   
 $E \Rightarrow aC$   
 $D \Rightarrow aDA$

c.) Construct a grammar in greibach normal form equivalent to the grammar [6]

$S \Rightarrow AA \mid a, A \Rightarrow SS \mid b.$

4) a.) Construct a PDA accepting  $L = \{0^n 1^n 0^n \mid n \geq 1\}$ . [6]

b.) Explain the model of linear bounded automaton. [6]

5) a.) Design a turing machine to recognise the language [6]

$\{1^n 2^n 3^n \mid n \geq 1\}.$

b.) Explain the Halting problem of Turing Machine. [6]

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