



QUIZ 3

CS205

21 Feb, 2023

Duration: 20 Min

Max Marks: 12

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### INSTRUCTIONS

- This question paper has 6 questions. All the answers are to be bubbled on the Answer Sheet.
- Each question could have multiple correct option. You need to mark all the correct options for getting credit. There is no partial marking. Each question carries 2 marks. You may use your own supplementary sheets for the rough work.

### MULTIPLE CHOICE QUESTIONS

**Question 1** Consider the grammar  $G : S \rightarrow aaB|Abb, A \rightarrow a|aA, B \rightarrow b|bB$ . Which of the following is/are true?

- ☒ A  $G$  is ambiguous  
☐ B  $L(G)$  is regular  
☒ C  $L(G)$  cannot be expressed by any regular expression  
☒ D  $L(G)$  is context-free but not regular  
☐ E  $L(G) = \{x \in \{a, b\}^* | x \text{ begins with } aa \text{ or ends with } bb\}$   $\alpha$

**Question 2** Consider the CFG  $G : S \rightarrow A1B, A \rightarrow 0A|\varepsilon, B \rightarrow 0B|1B|\varepsilon$ . Which one of the following is/are true?

- ☐ A  $L(G)$  is context-free but not regular  
☒ B  $G$  is ambiguous  
☒ C  $L(G) = 0^*1(0+1)^*$   
☐ D  $G$  is not linear  
☐ E  $L(G) = 0(0+1)^*$   $\alpha$

**Question 3** Consider the language  $L = L((1+0)(0^*+1))$ . The binary relation  $R_L$  (Myhill-Nerode relation) on  $\Sigma^*$  is defined as  $xR_L y$  iff  $\forall z \in \Sigma^* (xz \in L \text{ iff } yz \in L)$ . The number of equivalence classes of  $R_L$  is

- ☐ A 4    ☐ B 2    ☐ C 3    ☐ D 6    ☒ E 5    ☐ F infinite

**Question 4** Suppose  $G$  is a CFG in CNF and let  $x \in L(G)$  with  $|x| = 20$ . Then the length of the derivation of  $x$  in  $G$  is

- ☒ A 39    ☐ B 20    ☐ C 40    ☒ D 21    ☐ E 41

**Question 5** Consider the CFG  $G : S \rightarrow AB|BC, A \rightarrow a|aA, B \rightarrow \varepsilon|aBb, C \rightarrow b|bB$ . Then  $L(G)$  is

- ☐ A  $\{a^n b^m | m < n\}$   $\alpha \alpha$   
☒ B  $\{a^n b^m | m \neq n\}$   $\checkmark \checkmark$   
☐ C  $\{a^n b^m | n \geq 1, m \geq 0\}$   $\alpha$   
☒ D not regular  
☐ E  $\{a^n b^m | m > n\}$   $\alpha \alpha$

b/bC



✓ **Question 6** Which of the following grammars generate(s) the language  $\{a^m b^n \mid m > 0 \text{ or } n > 0\}$ ?

- ☐ **A**  $S \rightarrow AB, A \rightarrow a|aA, B \rightarrow b|bB$  ✗
- ☐ **B**  $S \rightarrow AB, A \rightarrow \varepsilon|aA, B \rightarrow \varepsilon|bB$  ✗
- ☐ **C**  $S \rightarrow AB, A \rightarrow a|aA, B \rightarrow \varepsilon|bB$  ✗
- ✓ ☒ **D**  $S \rightarrow aAB|ABb, A \rightarrow \varepsilon|aA, B \rightarrow \varepsilon|bB$
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+3/3/50+

## ANSWER SHEET

The last 3 digits of your Roll No. is your UID.  
For dual degree students the UID is 2xx, where xx is the last two digits of your Roll No.

## STUDENT INFORMATION

Please bubble your UID.

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	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

## RESPONSES

Q 1: ☒ A ☒ B ☒ C ☒ D ☐ E  
Q 2: ☐ A ☒ B ☒ C ☒ D ☐ E  
Q 3: ☐ A ☐ B ☐ C ☐ D ☒ E ☐ F

Q 4: ☒ A ☐ B ☐ C ☐ D ☐ E  
Q 5: ☐ A ☒ B ☐ C ☒ D ☐ E  
Q 6: ☐ A ☐ B ☐ C ☒ D

PLEASE DO NOT WRITE ANYTHING ON THE OTHER  
SIDE OF THE ANSWER SHEET.



+3/4/49+

