

QUIZ 4

CS205

28 March, 2023

Duration: 25 Min

Max Marks: 16

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INSTRUCTIONS

- This question paper has 8 multiple choice questions (MCQ).
- Each MCQ could have multiple correct option. You need to mark all the correct options for getting credit. There is no partial marking. Each MCQ carries 2 marks.

MULTIPLE CHOICE QUESTIONS

Question 1 Which of the following statements is/are true?

S1: For every DPDA that accepts by final state, there is an equivalent DPDA that accepts by empty stack.

S2: Given two PDAs M_1 and M_2 , we can construct a PDA for the language $L(M_1) \cap L(M_2)$.

- ☐ A Both S1 and S2 ☒ B Neither S1 nor S2 ☐ C S2 only ☒ D S1 only

Question 2 If L is generated by a CFG in CNF, then which of the following is/are certainly true?

- ☐ A L must be regular
☐ B L must be non-regular
☒ C L must be context-free
☒ D L can be either regular or non-regular

Question 3 The language $L = \{a^m b^n c^p d^k \mid \text{either } m = 0 \text{ or } n = p = k\}$

- ☒ A satisfies the pumping lemma
☒ B does not satisfy the pumping lemma
☒ C is context free
☒ D is not context-free

Question 4 Which of the following languages is/are context-free?

$L_1 = \{a^i b^j c^k d^l \mid i = l \text{ and } j \neq k\}$

$L_2 = \{a^m b^m a^n b^n \mid m \geq 0, n \geq 0\}$

$uvwx^ny$

- ☐ A L_1 only ☒ C L_2 only
☐ B Neither L_1 nor L_2 ☒ D Both L_1 and L_2

Question 5 Which of the following statements is/are certainly true?

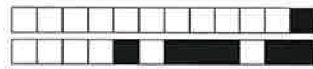
S1: Every context-free language is non-regular.

S2: There is a decision algorithm to determine if a CFL is nonempty.

- ☒ A S2 only ☐ B Neither S1 nor S2 ☐ C S1 only ☐ D Both S1 and S2

Question 6 Let $L = \{w \in \{a, b\}^* \mid \text{the first, middle and the last characters of } w \text{ are same.}\}$
Then which of the following is/are true?

- ☐ A L is neither regular nor context-free
☐ B L is regular
☒ C L is context-free but not regular
☒ D L is context-free



Question 7 Let L_1, L_2 and L_3 be languages over the alphabet $\Sigma = \{a, b\}^*$, where L_1 consists of all strings in Σ^* except the strings of length 2, L_2 can be generated by a regular grammar and L_3 is accepted by some PDA. Then which of the following is/are certainly true?

☐ A $L_1 \cup L_2 \cup L_3$ is context-free but not regular ☒ D $L_1 \cup L_2 \cup L_3$ is regular ✕

☐ B $L_1 \cap L_3$ may not be context-free

☒ C $(L_1 \cap L_2)L_3$ is context-free

☒ E $L_1 \cap L_2$ is regular

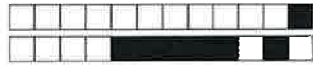
Question 8 The language $L = \{a^n | n \geq 0\} \cup \{a^n b^n | n \geq 0\}$ is

☒ A a dcf

☐ B accepted by a DPDA with empty stack

☒ C accepted by a DPDA with final state

☐ D a cfl but not a dcf



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.

Invigilator's Sign :

STUDENT INFORMATION

Please bubble your UID.

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<input checked="" type="checkbox"/>	1	2	3	4	5	6	7	8	9
0	1	2	3	<input checked="" type="checkbox"/>	5	6	7	8	9
0	<input checked="" type="checkbox"/>	2	3	4	5	6	7	8	9

RESPONSES

- Q 1: ☐ A ☒ B ☐ C ☒ D
- Q 2: ☐ A ☐ B ☒ C ☒ D
- Q 3: ☒ A ☐ B ☐ C ☒ D
- Q 4: ☐ A ☐ B ☒ C ☒ D

- Q 5: ☒ A ☐ B ☐ C ☐ D
- Q 6: ☐ A ☐ B ☒ C ☒ D
- Q 7: ☐ A ☐ B ☒ C ☒ D
- Q 8: ☒ A ☒ B ☒ C ☐ D

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



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