

Roll No:

Name:

Note: PDA by default is non-deterministic

Multiple Choice Questions. Write your choice in the given space (in the next page) only.

1. The recognition power of DPDA by empty stack is (A) equal to the recognition power of PDA by empty stack (B) equal to the recognition power of DPDA by final state (C) Equal to the recognition power of PDA by final state (D) none of the given choices
2. Pick the false statement (A) recognition power of PDA by final state is more than that of PDA by empty stack (B) recognition power of DPDA by final state is more than that of DPDA by empty stack. (C) DPDA by empty stack can not recognize the language  $a^*$  (D) None of the given choices.
3. CFL are not closed under (A) Set difference (B) Union (C) Concatenation (D) Kleene star
4. A string is of length 10. How many steps it takes to generate the string if the grammar is in CNF (A) 5 (B) 10 (C) 9 (D) None of these
5. Time complexity of CYK algorithm is (A)  $O(n^3)$  (B)  $O(n^2)$  (C)  $O(n)$  (D)  $O(\log n)$
6. Consider the following three languages,  $L_1 = \{ ww \mid w \in (0, 1)^* \}$ ,  $L_2 = \{ a^n b^n c^m \mid m, n \geq 0 \}$  and  $L_3 = \{ a^m b^n c^n \mid m, n \geq 0 \}$ . Which of the following statements is/are false?

(a)  $L_1$  is not CFL but  $L_2$  and  $L_3$  are DCFL (TRUE)

(b) Neither  $L_1$  nor  $L_2$  is CFL

(c)  $L_1$ ,  $L_3$ , and  $L_1 \cap L_3$  all are CFL

(d) Neither  $L_1$  nor its complement is CFL (TRUE)

7. Let  $L_1$  be a regular language and  $L_2$  be a CFL. Which of the following languages is/are CFL?

(a)  $L_1 \cap \overline{L_2}$  (b)  $\overline{L_1 \cup L_2}$  (c)  $L_1 \cup (L_2 \cup \overline{L_2})$  (d)  $(L_1 \cap L_2) \cup (\overline{L_1} \cap L_2)$

8. Which of the following is false?

(a) Power of DPDA is equal to power of PDA (note by default PDAs are non-deterministic)

(b) Every NFA can be converted into equivalent PDA

(c) Complement of every CFL is CFL

(d) Every PDA can be converted into DPDA

9. CFLs are closed under

(a) Union, Intersection (b) Union, Kleen Star Closure (c) Intersection, Complement (d) Complement, Kleen Star Closure

10. Identify the language generated by the grammar

$S \rightarrow XY$ ,  $X \rightarrow aX \mid a$ ,  $Y \rightarrow aYb \mid \epsilon$

(a)  $L = \{ a^m b^n \mid m \geq n, n > 0 \}$

(b)  $L = \{ a^m b^n \mid m \geq n, n \geq 0 \}$

(c)  $L = \{ a^m b^n \mid m > n, n \geq 0 \}$

(d)  $L = \{ a^m b^n \mid m > n, n > 0 \}$