

## Theory of Computation

## Push Down Automata

DPP 04

**[MCQ]**

1. Suppose  $L_1$  is a finite language and  $L_2$  is non-regular language then  $L_1 \cap L_2$  will be:
- Regular but infinite
  - Non-regular
  - Finite and regular
  - None of these

**[NAT]**

2. Consider a languages  $L$ :  
 $L = \{a^{29n+9} \mid n \geq 9\}$  then total number of minimum states in DFA will be\_\_\_\_\_.

**[MSQ]**

3. Consider the languages  $L = \{ab, aa, baa\}$  which of the following strings is/are in  $L^*$ .
- abaabaaabaa
  - aaaabaaaa
  - baaaaabaaaab
  - baaaaabaa

**[NAT]**

4. Consider the following statements:
- All finite language are context free language.
  - All regular language are finite.
  - All DCFL are finite.
  - All regular language are DCFL
  - There exists some language which are finite and irregular.
- The number of correct statements from the above statements are\_\_\_\_\_.

**[MCQ]**

5. Consider the following languages.
- $$L_1 = \{a^n b^n \mid n \geq 0\}$$
- $$L_2 = \{a^n b^m c^k \mid n, m, k \geq 0 \wedge n \neq m \vee m \neq k\}$$
- Which of the following statements is correct?
- $L_1$  is CFL and  $L_2$  is DCFL
  - $L_1$  is DCFL and  $L_2$  is CFL

- $L_1$  and  $L_2$  both are DCFL
- None of these.

**[MSQ]**

6. Which of the following grammar is/are generating DCFL but not regular language?
- $S \rightarrow aa S bb \mid \epsilon$
  - $S \rightarrow a S bb \mid \epsilon$
  - $S \rightarrow aa S b \mid \epsilon$
  - $S \rightarrow abS \mid \epsilon$

**[MCQ]**

7. Consider the following languages:
- $$L_1 = \{a^m b^n c^k \mid \text{if } (m = \text{even}) \text{ then } (n = k)\}$$
- $$L_2 = \{a^n c b^n\} \cup \{a^n d b^n\}$$
- Which of the following is correct statement?
- Only  $L_1$  is DCFL.
  - Only  $L_2$  is DCFL.
  - Both  $L_1$  and  $L_2$  are CFL but not DCFL
  - Both  $L_1$  and  $L_2$  are DCFL but not regular.

**[MCQ]**

8. Consider the following grammar:
- $$S \rightarrow AB$$
- $$A \rightarrow a A a \mid b A b \mid \epsilon$$
- $$B \rightarrow a B a \mid b B b \mid \epsilon$$
- Which of the following is correct regarding above grammar?
- Language produced by  $S$  is  $L = \{xx^R yy^R \mid x, y \in \{a, b\}^*\}$  and  $L$  is DCFL but not regular.
  - Language produced by  $S$  is  $L = \{xx^R yy^R \mid x, y \in \{a, b\}^*\}$  and  $L$  is CFL but not DCFL.
  - Language produced by  $S$  is  $L = \{xx^R yy^R \mid x, y \in \{a, b\}^*\}$  and  $L$  is DCFL.
  - None of the above.

## Answer Key

- |              |              |
|--------------|--------------|
| 1. (c)       | 5. (b)       |
| 2. (270)     | 6. (a, b, c) |
| 3. (a, b, d) | 7. (d)       |
| 4. (2)       | 8. (b)       |



## Hint & Solutions

1. (c)

Finite  $\cap$  non-regular always finite.

Hence, option (c) is correct.

2. (270)

Number of states =  $29 \times 9 + 9 = 270$ .

3. (a, b, d)

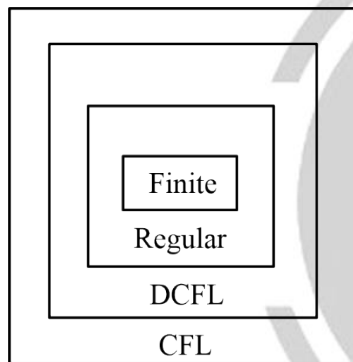
(a) abaabaaabaa will be generated by  $L^*$ .

(b) aaaabaaaa will be generated by  $L^*$ .

(c) baaaaabaaaab will not be generated by  $L^*$ .

(d) baaaaabaa will be generated by  $L^*$ .

4. (2)



From above diagram, we can say that statement (i), (iv) are correct.

5. (b)

$L_1$  is DCFL and  $L_2$  is CFL. So, option (b) is correct answer.

6. (a, b, c)

a, b, c are DCFL as they have comparison between number of a's & b's.

7. (d)

Both  $L_1$  &  $L_2$  are DCFL but not regular.

8. (b)

The given grammar will produce language

$L = \{xx^R yy^R \mid x, y \in \{a, b\}^*\}$  and the language is CFL but not DCFL.



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