Branch : CSE & IT   Batch : Hinglish

Theory of Computation
Push Down Automata
Context Free Grammar:CFL & DCFL | 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:
   (a) Regular but infinite
   (b) Non-regular
   (c) Finite and regular
   (d) 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^*.
   (a) abaabaaabaa
   (b) aaaabaaaa
   (c) baaaaabaaaab
   (d) baaaaabaa

[NAT]
4. Consider the following statements:
   (i) All finite language are context free language.
   (ii) All regular language are finite.
   (iii) All DCFL are finite.
   (iv) All regular language are DCFL.
   (v) 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?
   (a) L_1 is CFL and L_2 is DCFL
   (b) L_1 is DCFL and L_2 is CFL

   (c) L_1 and L_2 both are DCFL
   (d) None of these.

[MSQ]
6. Which of the following grammar is/are generating DCFL but not regular language?
   (a) $S \rightarrow aa\ S\ bb \mid \in$
   (b) $S \rightarrow a\ S\ bb \mid \in$
   (c) $S \rightarrow aa\ S\ b \mid \in$
   (d) $S \rightarrow abS \mid \in$

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

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

Answer Key

1. (c)
2. (270)
3. (a, b, d)
4. (2)

5. (b)
6. (a, b, c)
7. (d)
8. (b)

Hint & Solutions

1. (c)

Finite $\cap$ non-regular always finite.

Hence, option (c) is correct.

2. (270)

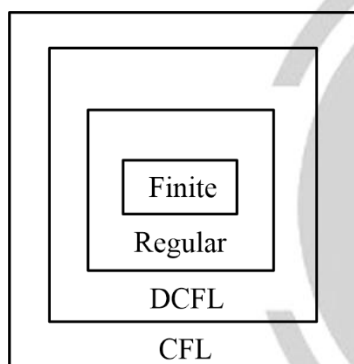Number of states $= 29 \times 9 + 9 = 270$.

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)

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