

CS & IT ENGINEERING

Push Down Automata Context Free Grammar

Theory of Computation

CFL & DCFL

DPP 04 Discussion Notes



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TOPICS TO BE COVERED

01 Question

02 Discussion

Q.1

Suppose L_1 is a finite language and L_2 is non-regular language then $L_1 \cap L_2$ will be:

[MCQ]



Fin \cap Non-reg \Rightarrow Fin

☒ A.

Regular but infinite

☒ B.

Non-regular

☒ C.

Finite and regular

☐ D.

None of these

Q.2

Consider a languages L:

[NAT]



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

$$= 271$$

$$a^{29 \times 9 + 9} = \underbrace{a^{270}}_{\text{min}}$$

$$L = \{ \underbrace{a^{270}}_{\downarrow 271 \text{ states}}, a^{299}, \dots \}$$

Q.3

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



[MCQ]

$$L^* = \{ab, aa, baa\}^*$$

A.

abaabaabaa $\in L^*$

B.

aaabaaaa $\in L^*$

C.

baaaabaaaab $\notin L^*$

D.

baaaabaa $\in L^*$

Q.4

[MCQ]



Consider the following statements:

- (i) All finite languages are context free languages ✓
- (ii) All regular languages are finite. ✗
- (iii) All DCFLs are finite. ✗
- (iv) All regular languages are DCFL ✓
- (v) There exists some language which are finite and ~~irregular~~ ^{not regular}. ✗

The number of correct statements from the above statements are 2.

Q.5

[MCQ]



Consider the following languages.

$$L_1 = \{a^n b^n \mid n \geq 0\} \rightarrow \text{DCFL}$$

$$L_2 = \{a^n b^m c^k \mid n, m, k \geq 0 \wedge n \neq m \vee m \neq k\} \rightarrow \text{CFL}$$

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.

Q.6

Which of the following grammar is/are generating DCFL but not regular language?

[MSQ]



A.

$$S \rightarrow aaSbb \mid \epsilon \Rightarrow a^{2n}b^{2n}$$

B.

$$S \rightarrow aSbb \mid \epsilon \Rightarrow a^n b^{2n}$$

C.

$$S \rightarrow aaSb \mid \epsilon \Rightarrow a^{2n}b^n$$

D.

$$S \rightarrow abS \mid \epsilon \Rightarrow (ab)^*$$

Q.7

[MCQ]



Consider the following languages:

$$L_1 = \{a^m b^n c^k \mid \text{if } (m = \text{even}) \text{ then } (n = k)\}$$

$$L_2 = \{a^n \underline{c} b^n\} \cup \{a^n \underline{d} b^n\} = a^n (c+d) b^n$$

→ DCFL

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.

Q.8

Consider the following grammar:

$S \rightarrow \underline{A} \underline{B}$

$A \rightarrow a A a \mid b A b \mid \epsilon$

$B \rightarrow a B a \mid b B b \mid \epsilon$

$\rightarrow x x^R$

$\rightarrow y y^R$

$L = \{ \underline{x x^R} \underline{y y^R} \mid x, y \in \{a, b\}^* \} \rightarrow \text{CFL}$

[NAT]



Which of the following is correct regarding above grammar?

~~A.~~

Language produced by S is $L = \{ \underline{x x^R} \underline{y y^R} \mid x, y \in \{a, b\}^* \}$ and L is ~~DCFL~~ but not regular.

B.

Language produced by S is $L = \{ \underline{x x^R} \underline{y y^R} \mid x, y \in \{a, b\}^* \}$ and L is CFL but not DCFL.

C.

Language produced by S is $L = \{ \underline{x x^R} \underline{y y^R} \mid x, y \in \{a, b\}^* \}$ and L is ~~DCFL~~.

D.

None of the above.

