

Type I : Design a PDA to accept

1. $a^n b^n$
2. $a^n b^{2n}$
3. $a^{2n} b^n$
4. $0^n 1^{2n+1}$
5. $\{a^n x \mid n \geq 0, x \in \{a, b\}^* \text{ and } |x| \leq n\}$
6. $\{x \in \{a, b\}^*, n_a(x) = n_b(x)\}$
7. $\{a^n b^{m+n} a^m \mid n, m \geq 0\}$
8. Equal Number of a's and b's
9. $\{c^{n+1} d^{m+1} \mid m, n \geq 1\}$
10. $\{a^n b^m a^n \mid m, n \geq 1\}$
11. Well-formedness of parenthesis OR balanced string of brackets
12. Atleast one occurrence of aa
13. $(ab)^n c^n$
14. $\{a^n b^m a^{n+m} \mid m, n \geq 1\}$
15. Even number of a's and odd number of b's
16. Even 'a' and odd 'b'
17. More a's than b's
18. $L = \{wcw^r \mid w \in \{a, b\}^*\}$ where w^r = reverse of w
19. $L = \{ww^r \mid w \in \{a, b\}^*\}$ where w^r = reverse of w

Type 2: PDA equivalent to the following grammar

1. $S \rightarrow aAA$
 $A \rightarrow aS \mid bS \mid a$
2. $S \rightarrow aA$
 $A \rightarrow aABC \mid bB \mid a$
 $B \rightarrow b$
 $C \rightarrow c$
3. $S \rightarrow aSa \mid bSb \mid c$
4. $E \rightarrow E+E \mid E^*E \mid (E) \mid id$

