THEORY OF COMPUTATION

DEPARTMENT OF COMPUTER ENGINEERING

Subject : TOC **ASSIGNMENT NO – 04** **Unit : IV**

THEORY QUESTION

1. Define **PDA**. What are different types of PDA? Applications of PDA?
2. Prove that "Let L be a language accepted by **deterministic PDA**, then the complement of L, can also be accepted by, deterministic PDA
3. Proves the **CFL are Closed under Union**, Concatenation and Kleene's closure.
4. Show that **CFL are closed under intersection** and Complementation.
5. Explain the working of **top down parser** and **bottom up parser** with example.
6. Differentiate between **FA and PDA.**
7. What are different ways to define PDA Acceptability
8. Explain acceptance by **PDA**

   i) By Final State

   ii) By Empty state

   Construct PDA that accepts all palindrome string over {a, b} . Specify simulation for string 'aba'.
9. **Explain Closure property of PDA** with suitable example.

POSTDOWN AUTOMATA (PDA)

10. Construct **PDA** that accepts the language by the following CFG.$S \rightarrow SS \mid (S) \mid ( )$
11. Design a PDA for accepting a language L = $\{a^n b^m c^n \mid m,n >= 1\}$
12. Design a PDA for accepting Language L = $\{W c W^R \mid W \in (a,b)^*\}$.
13. Construct **PDA** that accepts following language $L = \{a^n b^n \mid n \geq 0\}$.Write simulation for string 'aaabbb'
14. Design a **PDA** for the following LanguageL = $\{a^n b^{2n} \mid n >= 0\}$
15. Show that: $L = \{a^n b^n c^n \mid n \geq 1\}$ not a CFL
16. Design a **PDA** for the following LanguageL = $\{a^{2n} b^n \mid n >= 1\}$ n=3

POST MACHINE (PM)

17. What is **Post Machine**? Give formal definition of Post Machine. Construct a Post Machine for accepting strings with equal number of a's and b's.

18. Construct **post machine** that accepts following language

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

19. 13. Construct **post Machine** that accepts the following language.

$$L = \{ a^n b^n a^n \mid n \geq 0 \}$$

CFG TO PDA

20. Convert following **CFG to PDA**

S -> aSb | A

A -> bSa | S | ε

21. **Construct PDA** for the following Regular Grammar :

S → 0A | 1B | 0

A → A0 | B

B → c | d

NPDA

22.

What is NPDA? Construct a NPDA for $L = \{ a^i b^j c^k \mid i \neq j \text{ or } j \neq k \}$|

23.

Construct a NPDA that accepts the language $L = \{ a^{2n} \mid n > 0 \}$

24.

What is NPDA? Construct a NPDA for The set of all strings over {a,b} with even length palindrome. **[10]**

25. Construct the **NPDA** that accepts the language generated by

` S = S + S | S * S | 4

PDA TO CFG

26.
Give Context Free Grammar (CFG) generating the language accepted by the PDA M = {(q_0, q_1), (a ,b), ℵ q_0, Z_0, q_1} where δ is as follows.

1. (q_0, a, Z_0) → (q_0, XZ_0)
2. (q_0, a, X) → (q_0, XX)
3. (q_0, b, X) → (q_1, ∈)
4. (q_1, b, X) → (q_1, ∈)
5. (q_1, ∈, Z_0) → (q_1, ∈)

27.

Obtain the CFG for the PDA given by M = {{q_0, q_1}, {0, 1}, {z_0, X}, δ, q_0, z_0, ϕ} where δ is given as. **[9]**

$\delta(q_0, 1, z_0) = \{q_0, xz_0\}$ $\delta(q_0, 1, x) = \{q_0, xx\}$

$\delta(q_0, 0, x) = \{q_1, x\}$ $\delta(q_0, \varepsilon, z_0) = \{q_0, \varepsilon\}$

$\delta(q_1, 1, x) = \{q_1, \varepsilon\}$ $\delta(q_0, 1, z_0) = \{q_0, z_0\}$

28.

Obtain CFG for the PDA given below:

$\delta(q_0, 1, z_0,) = \{q_0, xz_0,\}$ $\delta(q_0, 1, x) = \{q_0, xx\}$

$\delta(q_0, 0, x) = \{q_1, x\}$ $\delta(q_0, \varepsilon, z_0,) = \{q_0, \varepsilon\}$

$\delta(q_1, 1, x) = \{q_1, \varepsilon\}$ $\delta(q_0, 1, z_0,) = \{q_0, z_0\}$

29.

Give a grammar for the language L(M), where:
M = ({q_0, q_1}, {0,1}, {z_0,x}, δ, q_0,Z_0, Φ).
And δ is given by:

$\delta(q_0, 1, z_0) = (q_0, xz_0)$ $\delta(q_0, \varepsilon, z_0) = (q_0, \varepsilon)$

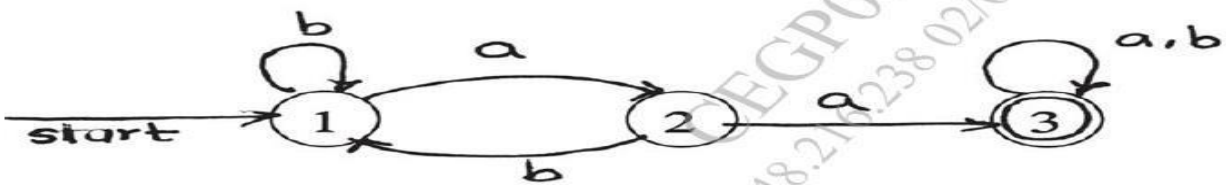
$\delta(q_0, 1, x) = (q_0, xx)$ $\delta(q_1, 1, x) = (q_1, \varepsilon)$

$\delta(q_0, 0, x) = (q_1, x)$ $\delta(q_0, 0, z_0) = (q_0, z_0)$

MISCELLNEOUS EXAMPLES

30.

Construct a PDA that recognizes the language accepted by following DFA. **[6]**



31.

Illustrate the working of Shift Reduce parser for id+id*id.

Consider the following grammar:

$$E \rightarrow E + E \mid T$$

$$T \rightarrow T * F \mid F$$

$$F \rightarrow \{E\} \mid id$$

**************************THE END*************************