Questions	1	2	3	4	5	6	7	8	Total
Marks obtained									

Examiner

Unit - III

Content Free Grammar

List of problems for Practice

Q. (1) Def?

(1) CFG

(2) Ambiguous Grammar

(3) Unambiguous Grammar

eg.1 Give Left most Derivation, Rightmost Derivation and Parse tree for following grammars.

(A) $S \to A1B$, $A \to 0A \mid \epsilon$ $B \to 0B \mid 1B \mid \epsilon$ "1001"

LMD

$S \to A1B$

$\Rightarrow \epsilon 1B$

$\Rightarrow \epsilon 10B$

$\Rightarrow \epsilon 100B$

$\Rightarrow \epsilon 1001B$

$\Rightarrow 1001\epsilon$

$\Rightarrow 1001$

RMD

$S \to A1B$

$\Rightarrow A10B$

$\Rightarrow A100B$

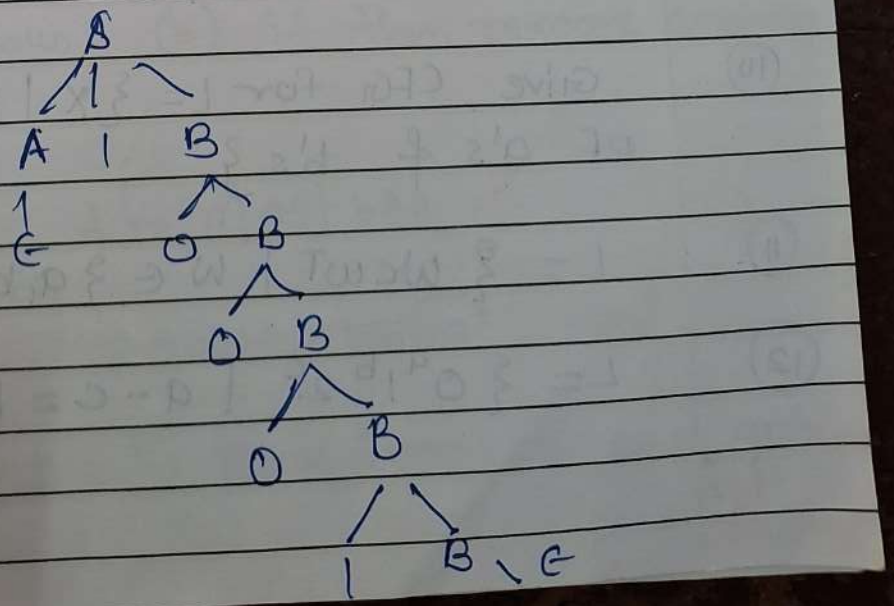
$\Rightarrow A1001B$

$\Rightarrow A1001\epsilon$

$\Rightarrow \epsilon 1001$

$\Rightarrow 1001$

Parse Tree



(2) $S \to XY$, $Y \to XY \mid b$ $X \to YY \mid a$
"aabbb"

(3) $E \to E+T \mid T$
$T \to T*F \mid F$
$F \to (E) \mid a \mid b$ "$(a+b)* a+b$"

Q.2 Give CFG for following lang.

(1) $L = \{ a^i b^j, \ i \le j \le 2i, \ i \ge 1 \}$.

(2) $0(0+1)^*01(0+1)^*1$

(3) $(0+1)1^*(1+(01)^*)$

(4) $L = \{ a^i b^j c^q ; \ i+j = q, \ i,j \ge 1 \}$

(5) $L = \{ a^i b^j c^k \mid i \ge j+k \}$

(6) $L = \{ a^i b^j c^k \mid i = j \text{ or } j \ge k \}$

(7) $L = \{ 0^i 1^j 0^k \mid j > i+k \}$

(8) Give CFG for matching parenthesis

(9) CFG for $L = \{ a^n b^m c^n \mid m,n \ge 1 \}$

(10) Give CFG for $L = \{ x \mid x$ contains equal no. of a's & b's $\}$

(11) $L = \{ wcw^T \mid w \in \{a,b\}^* \}$

$L = \{ 0^a 1^b 2^c \mid a-c = b \}$

Show grammar is ambiguous

(1) $E \rightarrow E+E \mid E*E \mid (E) \mid I$
$I \rightarrow a \mid b$

(a) Show Grammar is ambiguous
(b) Remove Ambiguity

(2) Give ambiguous grammar for "if-then-else" Statement & rewrite unambiguous grammar for it.

(3) $S \rightarrow SS \mid (S) \mid \epsilon$

(a) Show ambiguous (b) Remove Ambiguity

(4) Is it ambiguous?

$S \rightarrow aB \mid ab \quad A \rightarrow aAB \mid a, \quad B \rightarrow ABb \mid b$

(5) $S \rightarrow aAS \mid a$
$A \rightarrow SbA \mid SS \mid ba$
} Is ambiguous?

(6) $S \rightarrow as \mid \epsilon \quad S \rightarrow asbS$

(a) is ambiguous (b) if then remove ambiguity

(7) $S \rightarrow aB \mid bA \quad A \rightarrow a \mid as \mid bAA$
$B \rightarrow b \mid bS \mid aBB$
For string "aaabbabbba" find

(a) LMD (b) RMD (c) Parse Tree (d) is it ambiguous.

(8) $S \to SS \mid a \mid b$

(9) $S \to ABA$ ' $A \to aA \mid \epsilon$ $B \to bB \mid \epsilon$

(10) $S \to aSb \mid aaSb \mid \epsilon$

(11) $G = (V = \{E, F\}, T = \{a, b, -\}, E, P\}$

P is
$E \to F$, $E \to F - E$, $F \to a$, $E \to E - F$, $F \to b$

(a) is it ambiguous
(b) Remove Ambiguity

Q.4 Simplify the grammar

(1) Find Non-generating symbols in the grammar

$S \to AB \mid CA$
$A \to a$
$B \to BC \mid AB$
$C \to aB \mid b$

(2) Find Non-reachable Symbols

$S \to aBa \mid BC$
$A \to aC \mid BCC$
$C \to a$
$B \to bCC$, $D \to E$, $E \to d$

(3) Simplify the following grammar

$S \to ASB \mid \epsilon$
$A \to aAS \mid a$
$B \to SbS \mid A \mid bb$

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(2) $S \to 0A0 \mid 1B1 \mid BB$

$A \to C$

$B \to S \mid A$

$C \to S \mid \epsilon$

(3) $S \to Ab$, $A \to a$, $B \to C \mid b$, $C \to D$, $D \to E$, $E \to a$

2.5 convert to chomsky Normal Form (CNF)

(1) $S \to aAbB$ $A \to aA \mid \phi$ $B \to bB \mid b$

(2) $S \to PQP$ $P \to 0P \mid \epsilon$ $Q \to 1Q \mid \epsilon$

(3) $S \to bA \mid aB$ $A \to bAA \mid aS \mid a$ $B \to aBB \mid bS \mid b$

(4) $S \to Aba$, $S \to aab$, $B \to AAc$

2.6. convert to Greibach Normal Form (GNF)

(1) $S \to AA \mid a$ $A \to SS \mid b$

(2) $E \to E+T \mid T$

$T \to T*F \mid F$

$F \to a$

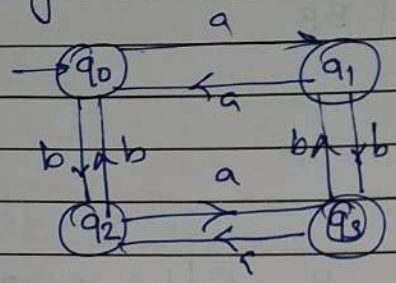
(3) $S \to AB$, $A \to Bs \mid b$ $B \to SA \mid b$

(4) $A_1 \to A_2A_3$, $A_2 \to A_3A_1 \mid b$, $A_3 \to A_1A_2 \mid a$

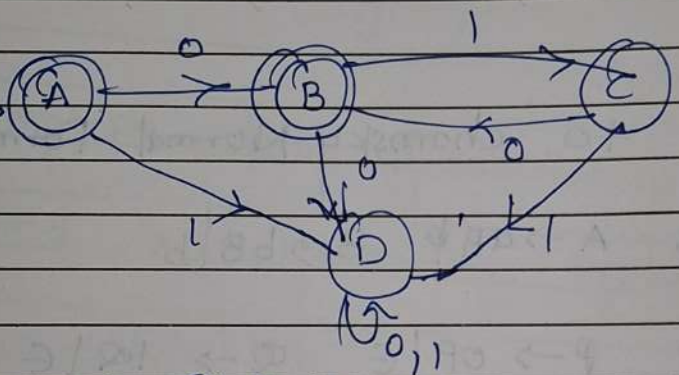
Q.7 Write short note on chomsky classification or Hirarchy.

Q.8 Convert Following

(1) Give Right Linear Grammar (RLG) for DFA



(2)



Q.9 Convert RLG to DFA

(3) $S \to bB \quad B \to bC \quad B \to aB \quad C \to a \quad B \to b$

(4)

$S \to 0A \mid 1B$

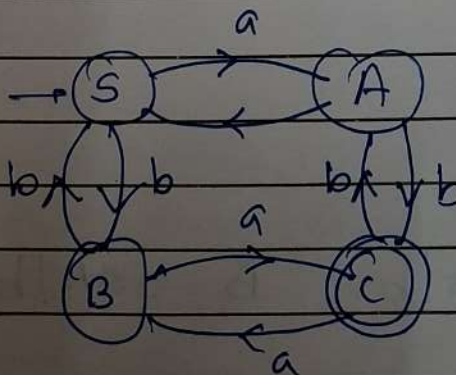
$A \to 0C \mid 1A \mid 0$

$B \to 1B \mid 1A \mid 1$

$C \to 0 \mid 0A$

Q.10 Convert DFA to LLG

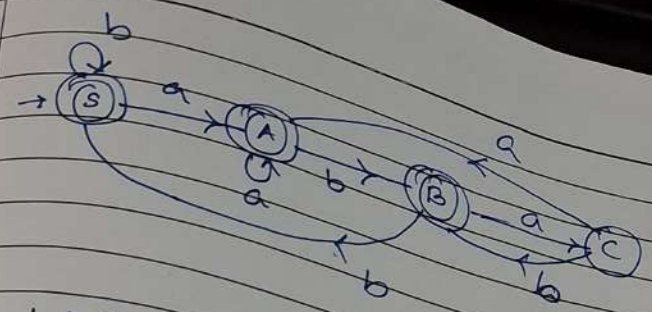
(1)



Hirarchy

(RLG) for DRA

a)



LLG to DFA

① $S \to Ca \mid Bb$, $C \to Bb$ $B \to Ba \mid b$

② $S \to B1 \mid A0 \mid C0$, $B \to B1 \mid 1$, $A \to A1 \mid B1 \mid C0 \mid 0$
$C \to A0$

Q.12 RLG to LLG

① $S \to bB \mid b$ $B \to bC \mid aB \mid b$, $C \to a$

② $S \to 0A \mid 1B$ $A \to 0C \mid 1A \mid 0$, $B \to 1B \mid 1A \mid 1$
$C \to 0 \mid 0A$

$B \to b$

Q.13 LLG to RLG

$S \to C0 \mid A0 \mid B1$
$A \to A1 \mid C0 \mid B1 \mid 0$
$B \to B1 \mid 1$, $C \to A0$

Q.14 Write short not on.
CFL closed under ① Union ② concatenation ③ Kleene start