(i)

ASSIGNMENT # 2

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18K-0363
Section D

Q1. $S \to aAB$ $A \to Bba$ $B \to bB$. $B \to c$

         $w = acbabc$

Derivation:
   aAB
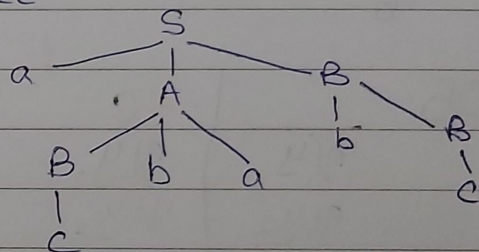   aAbB
   aAbc
   aBbabc
   acbabc

Tree:

Q2. $S \to a$ $S \to aAs$ $A \to bS$

         $w = abaabaa$
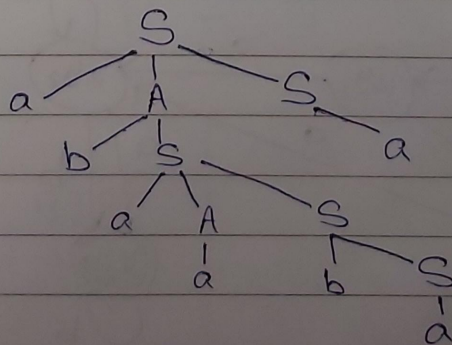
Q3. $S \to aSb$ $S \to ab$

   language $\{a^n b^n \mid n \geqslant 1\}$

Q4. $S \to aS$ $S \to aA$ $A \to bA$ $A \to b$
     Language: $\{a^m b^n \mid m \geq 1, n \geq 1\}$

Q5. $S \to aA$ $S \to bS$ $A \to b$
     Language: $\{b^n ab \mid n \geq 0\}$

Q6. a) $S \to SaSaS \mid SbSbS \mid \varepsilon$
    b) $S \to SaSaSbS \mid SbSaSaS \mid SaSbSaS \mid \varepsilon$
    c) $S \to SaSaSaSbS \mid SaSaSbSaS \mid SaSbSaSaS \mid SbSaSaSaS \mid \varepsilon$
    d) $S \to 0A1 \mid \overset{A}{B}0 \mid 0 \mid 1$
        $A \to 0A \mid 1A \mid A1 \mid 0 \mid 1 \mid \varepsilon$
    e) $S \to A \mid B \mid C \mid D$
        $A \to 00A \mid 00$
        $B \to 11B \mid 11$
        $C \to 10C \mid 10$
        $D \to 01D \mid 01$
    f) $S \to 0S0 \mid 1S1 \mid A \mid 01 \mid 10$
        $A \to 0B1 \mid 1B0$
        $B \to \varepsilon \mid 0B \mid 1B$
    g) $S \to A1B$
        $A \to 0A1 \mid \varepsilon$
        $B \to 1B2 \mid 1B \mid \varepsilon$
    h) CFG Cant be produced.

Q7 S→aB   S→bA   A→aS   A→aAA   A→a
       B→bs   B→aBB   B→b

                           string = aaa bb a bbb a

Leftmost Derivation:		Rightmost Derivation:	
S → aB		S → a B	(S→aB)
aaBB	(B→aBB)	aaBB	(B→aBB)
aaa BBBB	(B→aBB)	aaBbS	(B→bS)
aaabBBB	(B→b)	aaB bbA	(S→bA)
aaabb BB	(B→b)	aaBbba	(A→a)
aaa bba BBB	(B→abb)	aaaBBbba	(B→aBB)
aaa bbab B	(B→b)	aaa B bbba	(B→b)
aaa bbabbS	(B→bS)	aaa b S bbba	(B→bS)
aaa bba bbbA	(S→bA)	aaabb A bbba	(S→bA)
aaa bba bbb a	(A→a)	aaa bba bbba	(A→a)
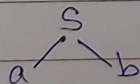
Q8.   Parse Tree 1.

                          Parse Tree 2
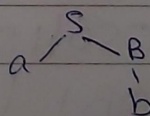
Ambigious as there are 2 or more trees for string "ab"

Q9. Tree 1

                          Tree 2
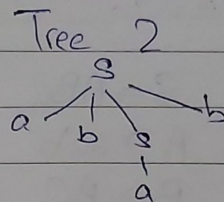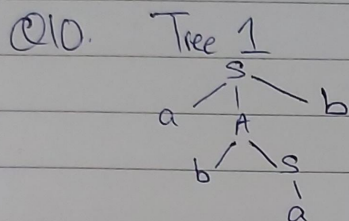

Ambigious as there are 2 or more trees for string "a"

④

Q10.   Tree 1   Tree 2

ambigious as there are 2 or more ~~string~~ trees for string "abab"

Q11.   S → AB

A → a   B → b

B → C   E → c | λ
  ↓   ↳ removed because non-reachable Variable.
removed because
non-generating symbol

Remaing: S → AB   A → a   B → b

Q12   S → ABaC | AaC | ABa | BaC | Aa | Ba | aC | a
        A → BC | B | C
        B → b
        C → D
        D → d.

Q13.

No ε-Productions   S → X₀Z
No Unit productions   Z → AY
No Useless Symbol   Y → X₁B
X₀ = a, X₁ = b   A → X₀A | a
                                      B → X₁B | b

per3/2.

Q14. S → ABa
A → aab
B → AC

No ε-Production
No Unit production
Eliminating useless & non-generating symbols

S → ABa
A → aab

removing non-reachable symbols.

as B is non-reachable, S produce nothing.