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17/sci01/067

Assignment

CSC 304

i) $S \longrightarrow aS \longrightarrow a\lambda \longrightarrow a$

$S \longrightarrow aS \longrightarrow abS \longrightarrow ab\lambda \longrightarrow ab$

$S \longrightarrow bS \longrightarrow b\lambda \longrightarrow b$

$S \longrightarrow bS \longrightarrow baS \longrightarrow ba\lambda \longrightarrow ba$

$S \longrightarrow aS \longrightarrow abs \longrightarrow abaS \longrightarrow aba\lambda \longrightarrow aba$

$S \longrightarrow bs \longrightarrow bas \longrightarrow baaS \longrightarrow baa\lambda \longrightarrow baa$

$\{ \lambda, a, ab, b, ba, aba, baa \cdots \}$

$(a^n b^m | n \geq 0, m \geq 0)$

ii) $S \longrightarrow aAb \longrightarrow aab$

$S \longrightarrow aAb \longrightarrow aaAb \longrightarrow aaab$

$S \longrightarrow aBb \longrightarrow abb$

$S \longrightarrow aBb \longrightarrow abBb \longrightarrow abbb$

$S \longrightarrow aSb \longrightarrow aaAb \longrightarrow aaaAb \longrightarrow aaaab$

$S \longrightarrow aSb \longrightarrow aaBb \longrightarrow aabBb \longrightarrow aabbb$

$\{ aab, aaab, abb, abbb, aaaab, aabbb, \cdots \}$

$(a^{n+1} b^m | n \geq 0, m \geq 0)$

iii) $S \longrightarrow As \longrightarrow aS \longrightarrow a\lambda \longrightarrow a$

$S \longrightarrow Bs \longrightarrow bs \longrightarrow b\lambda \longrightarrow b$

$S \longrightarrow As \longrightarrow aS \longrightarrow aBs \longrightarrow abs \longrightarrow ab\lambda \longrightarrow ab$

$S \longrightarrow BS \longrightarrow bs \longrightarrow bAs \longrightarrow bas \longrightarrow ba\lambda \longrightarrow ba.$

$\zeta \quad S \longrightarrow aSa \mid bSb \mid a \mid b \mid \lambda$

$a \quad S \longrightarrow aSa \longrightarrow a\lambda a$

$= aa$
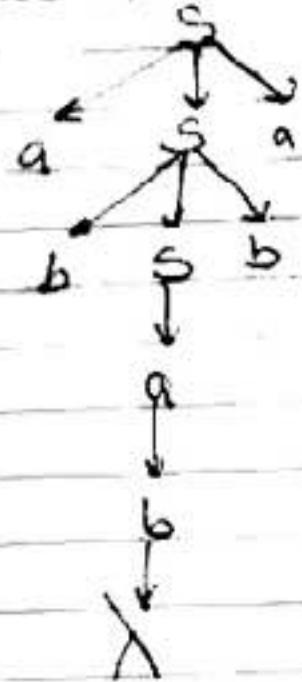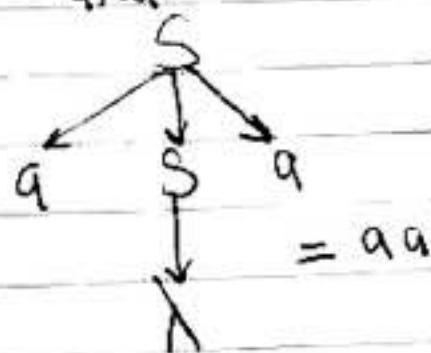
$b \quad S \longrightarrow aSa \longrightarrow aaa$

$= aaa$
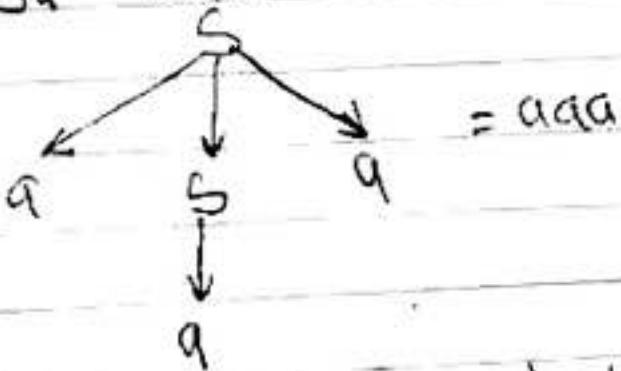
$c \quad S \longrightarrow aSa \longrightarrow abSba \longrightarrow ab\lambda ba \longrightarrow abba$

$= abba$

**d** $S \rightarrow bSb \rightarrow b\lambda b \rightarrow bb$

```
          S
       ↙  ↓  ↘
      b    S    b
           ↓          = bb
           λ
```

**e** $S \rightarrow aSa \rightarrow abSba \rightarrow abbba$

```
          S
       ↙  ↓  ↘
      a    S    a      = abba
         ↙ ↓ ↘
        b  S  b
           ↓
           b
```

f $S \rightarrow bSb \rightarrow baSab \rightarrow ba\lambda ab \rightarrow baab$

```
          S
       ↙  ↓  ↘
      b    S    b    = baab
         ↙ ↓ ↘
        a  S  a
           ↓
           λ
```

g $S \rightarrow bSb \rightarrow bab$

```
          S
       ↙  ↓  ↘
      b    S    b      = bab
           ↓
           a
```
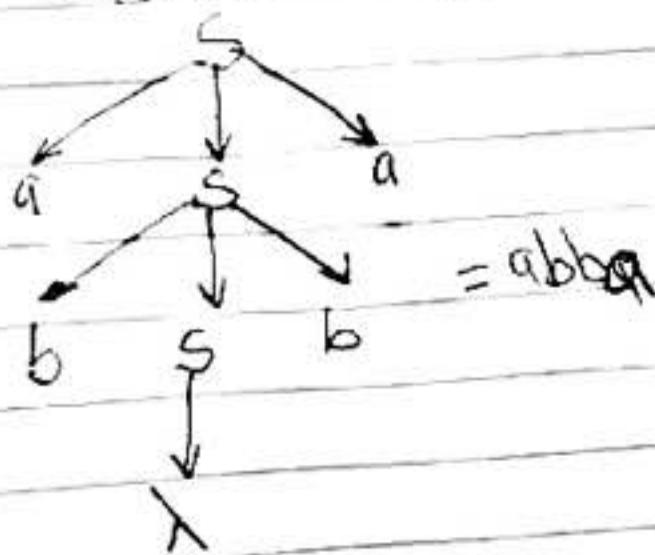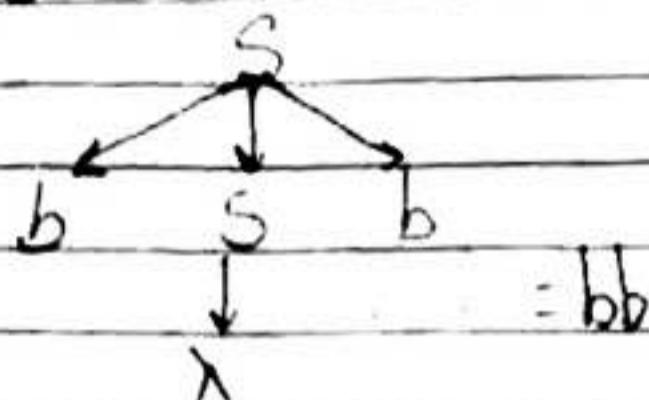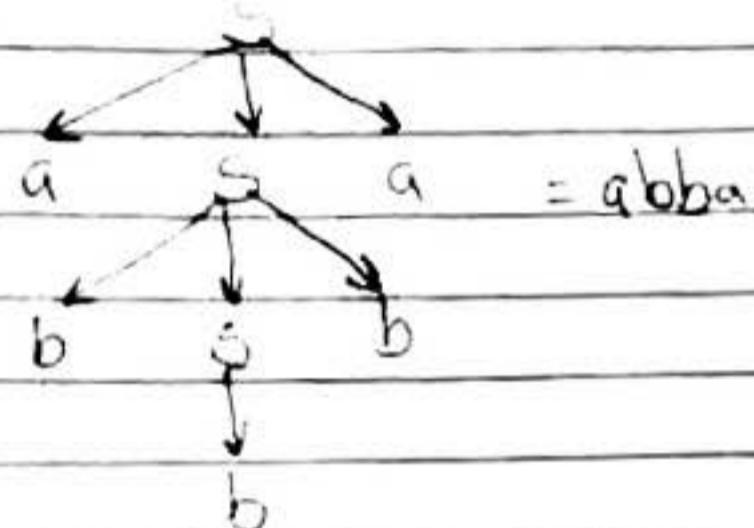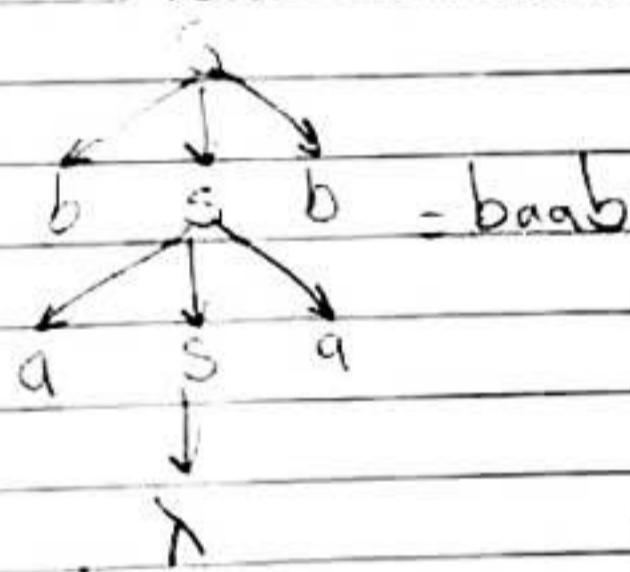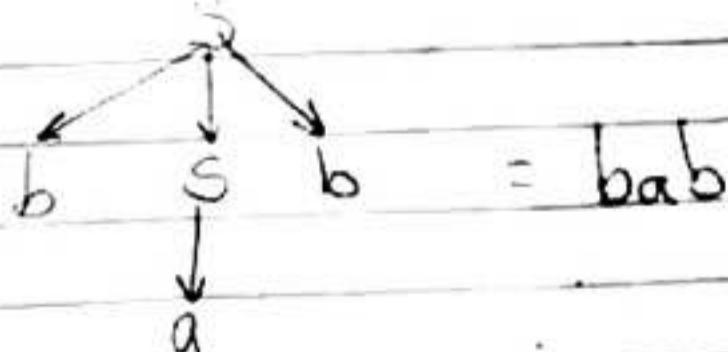
h $S \rightarrow bSb \rightarrow bbb$

```
          S
       ↙  ↓  ↘
      b    S    b     = bbb
           ↓
           b
```
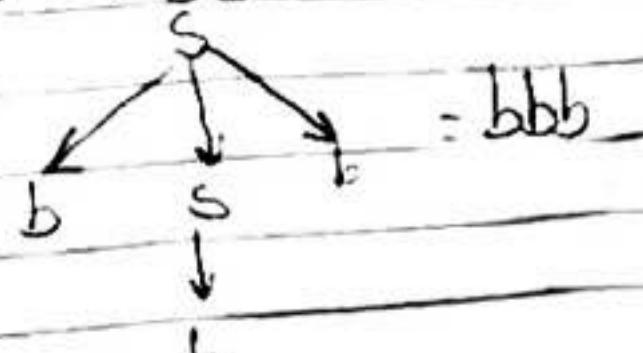
i. $S \longrightarrow aSa \longrightarrow abSba \longrightarrow ababa$
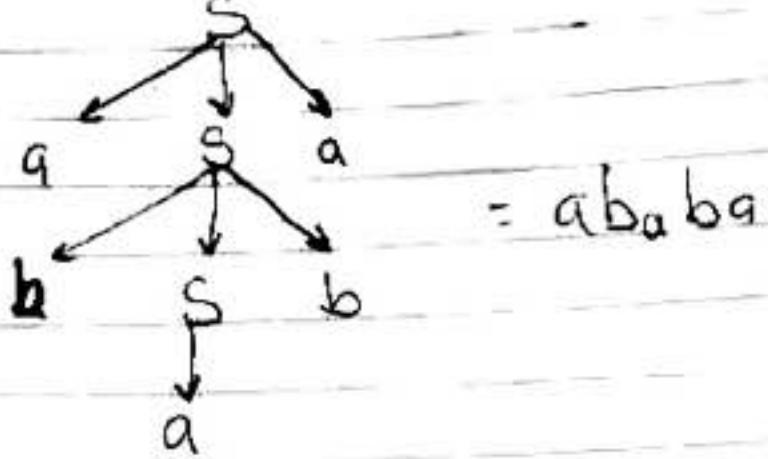
$= ab_a ba$

ii. $S \longrightarrow aSa \longrightarrow aba$

$= aba$
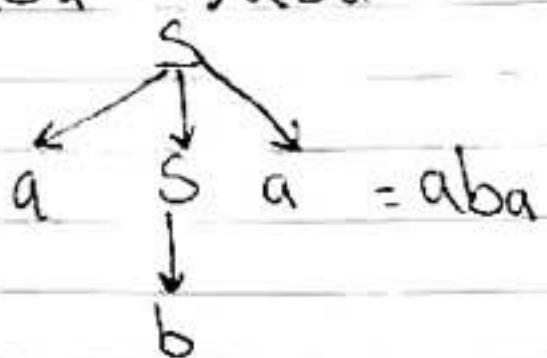
$= \{ \lambda, aa, aaa, abba, bb, bab, bbb, ababa, abbba, baab, ... \}$

3. i. $\Sigma = \{0,1\}$

$G = (V = \{S\}, \Sigma = \{0, 1\} S, R)$ where R

$S \longrightarrow 0 |1| 1S1 | 0S0 | 1S0 | 0S1$

The parse: 0111001001

4. $S \longrightarrow Ab, \quad A \longrightarrow aA | bA | \lambda$

Solution

$S \longrightarrow aAb \longrightarrow a\lambda b \longrightarrow ab$

$S \longrightarrow aAb \longrightarrow aaAb \longrightarrow aa\lambda b \longrightarrow aab$

$S \longrightarrow aAb \longrightarrow abAb \longrightarrow ab\lambda b \longrightarrow abb$

$S \longrightarrow aAb \longrightarrow aaAb \longrightarrow aabAb \longrightarrow aab\lambda b \longrightarrow aabb$

$S \longrightarrow aAb \longrightarrow abAb \longrightarrow abaAb \longrightarrow aba\lambda b \longrightarrow abab$

$S \longrightarrow AB \longrightarrow aAb \longrightarrow aab$

$S \longrightarrow AB \longrightarrow aAB \longrightarrow aaAB \longrightarrow aaabB \longrightarrow aaabB$

$aaabb B \longrightarrow aaabbb B \longrightarrow aaabbb$

$\{ ab, aab, abbb, abb, aaabbbb \dots \}$

$\{ a^n b^{m+1} \mid n \geq 0, m \geq 0 \}$