

Date: **27-3-24**

Day: **Wednes**

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Roll no: 201-1163

Sec: 6C

Assignment: 03

QUESTION No: 01

A) $S \rightarrow TU/V$

$T \rightarrow aTb/\epsilon$

$U \rightarrow cU/\epsilon$

$V \rightarrow aVc/W$

$W \rightarrow bW/\epsilon$

→ Add a new start symbol

$S_0 \rightarrow S$

$S \rightarrow TU/V$

$T \rightarrow aTb/\epsilon$

$U \rightarrow cU/\epsilon$

$V \rightarrow aVc/W$

$W \rightarrow bW/\epsilon$

→ ϵ eliminate Null production

$S_0 \rightarrow S$

$S \rightarrow TU/V/U$

$T \rightarrow aTb/ab$

$U \rightarrow cU/\epsilon$

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$(\because T \rightarrow \epsilon)$ $V \rightarrow aVc/W$ $W \rightarrow bW/\epsilon$ $(\because U \rightarrow \epsilon)$ $S_0 \rightarrow S$ $S \rightarrow TV/U/U/T/\epsilon$ $T \rightarrow aTb/ab$ $U \rightarrow cU/c$ $V \rightarrow aVc/W$ $W \rightarrow bW/\epsilon$ $(\because W \rightarrow \epsilon)$ $S_0 \rightarrow S$ $S \rightarrow TV/U/U/T/\epsilon$ $T \rightarrow aTb/ab$ $U \rightarrow cU/c$ $V \rightarrow aVc/\epsilon$ $W \rightarrow bW/b$ $(\because V \rightarrow \epsilon)$ $S_0 \rightarrow S$ $S \rightarrow TV/U/T$ $T \rightarrow aTb/ab$ $U \rightarrow cU/c$ $V \rightarrow aVc/ac$ $W \rightarrow bW/b$

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→ Eliminate Unit Production

$$S \rightarrow S$$

$$\therefore S \rightarrow T$$

$$S \rightarrow TU/cU/c/aTb/ab$$

$$\therefore S \rightarrow U$$

$$T \rightarrow aTb/ab$$

$$U \rightarrow cU/c$$

$$V \rightarrow aVc/ac$$

$$W \rightarrow bW/b$$

→ Remove of useless symbol

$$\{c, a, b, S, T, U, V, W\}$$

$$S \rightarrow S$$

$$S \rightarrow TU/cU/c/aTb/ab$$

$$U \rightarrow cU/c$$

$$V \rightarrow aVc/ac$$

$$W \rightarrow bW/b$$

add new production

$$X \rightarrow aT$$



B) $S \rightarrow ASA/aB$

$$A \rightarrow B/S$$

$$B \rightarrow b/\epsilon$$

$$X \rightarrow A$$

→ Add new start symbol

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$$S_0 \rightarrow S$$

$$S \rightarrow ASA / aB$$

$$A \rightarrow B / S$$

$$B \rightarrow b / \epsilon$$

$$X \rightarrow A$$

→ Eliminate Null production

$$(\because A \rightarrow \epsilon)$$

$$S_0 \rightarrow S$$

$$S \rightarrow ASA / aB / a$$

$$A \rightarrow B / S / \epsilon$$

$$B \rightarrow b$$

$$X \rightarrow A$$

$$(\because A \rightarrow \epsilon)$$

$$S_0 \rightarrow S$$

$$S \rightarrow ASA / aB / a / SA / AS / S$$

$$A \rightarrow B / S$$

$$B \rightarrow b$$

$$X \rightarrow A$$

→ Eliminate Unit production

$$S_0 \rightarrow S$$

$$(\because A \rightarrow b)$$

$$S \rightarrow ASA / aB / a / SA / AS / S$$

$$A \rightarrow b / S$$

$$B \rightarrow b$$

$$X \rightarrow A$$

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$S_0 \rightarrow ASA / aB / a / SA / AS$
 $S \rightarrow ASA / aB / a / SA / AS$
 $A \rightarrow b / ASA / aB / a / SA / AS$
 $B \rightarrow b$
 $X \rightarrow b / ASA / aB / a / SA / AS$

$S_0 \rightarrow S$
 $A \rightarrow S$
 $X \rightarrow A$

→ ~~err~~ Removal of useless symbols

$\{ a, b, S_0, S, A, B, X \}$

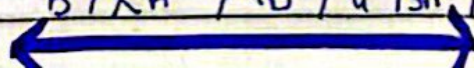
$S_0 \rightarrow ASA / aB / a / SA / AS$
 $S \rightarrow ASA / aB / a / SA / AS$
 $A \rightarrow b / ASA / aB / a / SA / AS$
 $B \rightarrow b$
 $X \rightarrow b / ASA / aB / a / SA / AS$

→ Add new production

$X \rightarrow AS$

Final:-

$S_0 \rightarrow A / aB / a / SA / X$
 $S \rightarrow XA / aB / a / ASA / X$
 $A \rightarrow b / XA / aB / a / SA / X$
 $B \rightarrow b$
 $X \rightarrow b / XA / aB / a / SA / X$



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$$\begin{aligned} C) \quad S &\rightarrow a / a A / a B \\ A &\rightarrow a B B / \epsilon \\ B &\rightarrow A a / b \end{aligned}$$

→ Eliminate Null production ($A \rightarrow \epsilon$)

$$\begin{aligned} S &\rightarrow a / a A / a B / \\ A &\rightarrow a B B \\ B &\rightarrow A a / b / a \end{aligned}$$

→ Eliminate unit production
no need already eliminated

→ Remove useless symbols

$$\{ a, b, S, B, A \}$$

$$\begin{aligned} S &\rightarrow a / a A / a B \\ A &\rightarrow a B B \\ B &\rightarrow A a / b / a \end{aligned}$$

