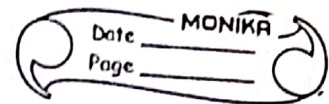


Roll No. 17103011

TOC Assignment 4



1.

$$S \rightarrow aB | sB$$

$$A \rightarrow BAc | bSc | a$$

$$B \rightarrow aSB | bBC$$

$$C \rightarrow aBC | ac$$

Since S & B are non generating symbols they are eliminated. Since, the starting symbol S is eliminated, the final production is

$$S \rightarrow \phi$$

2.

$$S \rightarrow ac | sB$$

$$A \rightarrow bSc$$

$$B \rightarrow aSB | bBC$$

$$C \rightarrow aBC | ad$$

Since B is a non generating symbol, it is eliminated.

Here A is unreachable also. It will also be eliminated.

So reduced grammar is

$$S \rightarrow ac$$

$$C \rightarrow ad$$

②

$$S \rightarrow ABAC$$

$$A \rightarrow aA|E$$

$$B \rightarrow bB|E$$

$$C \rightarrow C$$

Removing ϵ production ($A \rightarrow E$)

$$S \rightarrow ABAC | BAC | ABC | BC$$

$$A \rightarrow aA|a$$

$$B \rightarrow bB|b$$

$$C \rightarrow C$$

Removing ϵ production ($B \rightarrow E$)

$$S \rightarrow ABAC | BAC | ABC | BC | AAC | AC | C$$

$$A \rightarrow aA|a$$

$$B \rightarrow bB|b$$

$$C \rightarrow C$$

④

$$S \rightarrow 0A0 | 1B1 | BB$$

$$A \rightarrow C$$

$$B \rightarrow S | A$$

$$C \rightarrow S | E$$

①

There are no useless symbols.

②

(b) Eliminating ϵ production:-

$(C \rightarrow \epsilon) \Rightarrow$
 $S \rightarrow \epsilon A \epsilon \mid \epsilon B \mid \epsilon B$
 $A \rightarrow C \mid \epsilon$
 $B \rightarrow S \mid A$
 $C \rightarrow S$

$(A \rightarrow \epsilon) \Rightarrow$
 $S \rightarrow \epsilon A \epsilon \mid \epsilon B \mid \epsilon B \mid \epsilon \epsilon$
 $A \rightarrow C$
 $B \rightarrow S \mid A \mid \epsilon$
 $C \rightarrow S$

$(B \rightarrow \epsilon) \Rightarrow$
 $S \rightarrow \epsilon A \epsilon \mid \epsilon B \mid \epsilon B \mid \epsilon \epsilon \mid \epsilon \epsilon \mid \epsilon B \mid \epsilon$
 $A \rightarrow C$
 $B \rightarrow S \mid A$
 $C \rightarrow S$

(c) Eliminating unit production

$S \rightarrow B, A \rightarrow C, B \rightarrow S, B \rightarrow A, C \rightarrow S$

$\therefore S \rightarrow \epsilon S \epsilon \mid \epsilon S \mid S S \mid \epsilon \epsilon \mid \epsilon \epsilon \mid \epsilon$