COS 210

Worksheet 8

Scott Bebington

U21546216

Question 1

G = (V, Σ, R, A)

Where

V = {A, B, C}

Σ = {0, 1}

A is the start symbol

R contains the following rules:

A → 0B | 1B

B → 0B | 1C

C → 1B | 0A

Question 2

S → A

A → 0A | 1B | B

B → 0B | 1A | ε

Since there are no ε in A, we do not have to remove anything

However there are in B

Step 2

Eliminate all rules of the form A → ε where A ≠ S

Remove B → ε, then consider all rules with B on the right-hand side:

1. A → 1B is a rule, Add A → 1 as a rule
2. A → B is a rule, DO NOT Add A → ε as a rule as it has already been removed

S → A

A → 0A | 1B | B | 1

B → 0B | 1A

Question 3

S → A

A → 0A | 1A | B

B → 0 | 1 | B

Eliminate all unit rules A → A, no such rule exists

Add all other rules: already contained

S → A

A → 0A | 1A | B

B → 0 | 1 | B

Eliminate all unit rules B → B

Add all other rules: B → 0 | 1 (Already contained)

S → A

A → 0A | 1A | B

B → 0 | 1

Eliminate all unit rules S → A

Add all other rules: S → 0A | 1A | B

S → 0A | 1A | B

A → 0A | 1A | B

B → 0 | 1

Eliminate all unit rules S → B

Add all other rules: S → 0 | 1

S → 0A | 1A | 0 | 1

A → 0A | 1A | B

B → 0 | 1

Eliminate all unit rules A → B

Add all other rules: A → 0 | 1

S → 0A | 1A | 0 | 1

A → 0A | 1A | 0 | 1

B → 0 | 1

Question 4

S → AA

A → BAB | 0A | 1B

B → BABA | 1A | 0B

Eliminate all rules with more than two symbols on the right

Remove A → BAB and replace it with A → BA1, A1 → AB

Remove B → BABA and replace it with B → BA2, A2 → AA3, A3 → BA

S → AA

A → BA1 | 0A | 1B

A1 → AB

B → BA2 | 1A | 0B

A2 → AA3

A3 → BA

Question 5

S → AB | BA

A → 0A | 1B

B → 00 | 11

Replace A → 0A with: A → A1A, A1 → 0

Replace A → 1B with: A → A2B, A2 → 1

Replace B → 00 with: B → A1A1

Replace B → 11 with: B → A2A2

S → AB | BA

A → A1A | A2B

B → A1A1 | A2A2

A1 → 0

A2 → 1