Find the language generated by following grammars

S $\rightarrow$ abB
A $\rightarrow$ aaBb | λ
B $\rightarrow$ bbAa
Here Minimum length string is abbba
S $\Rightarrow$ abB
$\Rightarrow$ ab$\underline{\text{bbAa}}$ (B $\rightarrow$ bbAa)
$\Rightarrow$ abbba (A $\rightarrow$ λ)

Other possibility
S $\Rightarrow$ abB
$\Rightarrow$ ab$\underline{\textbf{bbAa}}$ (B $\rightarrow$ bbAa)
$\Rightarrow$ abbb$\underline{\textbf{aaBb}}$a (A $\rightarrow$ aaBb)
$\Rightarrow$ abbbaa$\underline{\textbf{bbAa}}$ba (B $\rightarrow$ bbAa)
$\Rightarrow$ abbbaabb$\underline{\textbf{aaBb}}$aba (A $\rightarrow$ aaBb)
$\Rightarrow$ abbbaabbaa$\underline{\textbf{bbAa}}$baba (B $\rightarrow$ bbAa)
$\Rightarrow$ abbbaabbaabb$\underline{\textbf{aaBb}}$ababa (A $\rightarrow$ aaBb)
$\Rightarrow$ abbbaabbaabbaa$\underline{\textbf{bbAa}}$bababa (B $\rightarrow$ bbAa)
$\Rightarrow$ abbbaabbaabbaabbabababa (A $\rightarrow$ λ)

Hence language is L = { $ab(bbaa)^n\, bba\, (ba)^n \mid n \geq 0$ }
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S $\rightarrow$ 0A0
A $\rightarrow$ 0A0 | 1

Here Minimum length string is 010
S $\Rightarrow$ 0A0
$\Rightarrow$ 010 (A $\rightarrow$ 1)

Other possibility
S $\Rightarrow$ 0A0
$\Rightarrow$ 00A00 (A $\rightarrow$ 0A0)
$\Rightarrow$ 000A000 (A $\rightarrow$ 0A0)
$\Rightarrow$ 0000A0000 (A $\rightarrow$ 0A0)
$\Rightarrow$ 00000100000 (A $\rightarrow$ 1)

Hence the language is L = {$0^n10^n \mid n \geq 1$}
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S $\rightarrow$ 0S1 | 0A1
A $\rightarrow$ 1A | 1
Here Minimum length string is 011
S $\Rightarrow$ 0A1
$\Rightarrow$ 011 (A $\rightarrow$ 1)

Other possibility

$S \Rightarrow 0S1$

$\Rightarrow 0\underline{\mathbf{0S1}}1$ ($S \rightarrow 0S1$)

$\Rightarrow 00\underline{\mathbf{0S1}}11$ ($S \rightarrow 0S1$)

$\Rightarrow 000\underline{\mathbf{0A1}}111$ ($S \rightarrow 0A1$)

$\Rightarrow 0000\underline{\mathbf{1A}}1111$ ($A \rightarrow 1A$)

$\Rightarrow 00001\underline{\mathbf{1A}}1111$ ($A \rightarrow 1A$)

$\Rightarrow 000011\underline{\mathbf{1A}}1111$ ($A \rightarrow 1A$)

$\Rightarrow 0000111\underline{\mathbf{1}}1111$ ($A \rightarrow 1$)

S $\rightarrow$ 0S1 | 1S1 | A

A $\rightarrow$ 2B3

B $\rightarrow$ 2B3 | 3

Here the minimum length string is 233

$S \Rightarrow A$

$\Rightarrow 2B3$ ($A \rightarrow 2B3$)

$\Rightarrow 233$ ($B \rightarrow 3$)

Other possibility

$S \Rightarrow 0S0$

$\Rightarrow 0\underline{\mathbf{1S1}}0$ ($S \rightarrow 1S1$)

$\Rightarrow 01\underline{\mathbf{0S0}}10$ ($S \rightarrow 0S0$)

$\Rightarrow 010\underline{\mathbf{0S0}}010$ ($S \rightarrow 0S0$)

$\Rightarrow 0100\underline{\mathbf{1S1}}0010$ ($S \rightarrow 1S1$)

$\Rightarrow 01001\underline{\mathbf{A}}10010$ ($S \rightarrow A$)

$\Rightarrow 010012\underline{\mathbf{2B3}}10010$ ($A \rightarrow 2A3$)

$\Rightarrow 0100122\underline{\mathbf{2B3}}310010$ ($B \rightarrow 2A3$)

$\Rightarrow 0100122\underline{\mathbf{3}}3310010$ ($B \rightarrow 3$)

Hence the language is = $\{W2^m3^{m+1}W \mid W \in \{0, 1\}^*, m \geq 1\}$

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The language is $L = \{0^m 1^n : \quad n > m \geq 1\}$

S $\rightarrow$ 0S1 | 0A | 1B | 0 | 1

A $\rightarrow$ 0A | 0

B $\rightarrow$ 1B | 1

The language is $L = \{0^m 1^n : \quad n \neq m, at$ least one of the m and n $\geq 1\}$

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S $\rightarrow$ 0S1 | 0A1

A $\rightarrow$ 1A0 | 10

The language is $L = \{0^n 1^m 0^m 1^n : \quad n \geq 1, m \geq 1\}$

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S $\rightarrow$ 0A | 1S | 0 | 1

A $\rightarrow$ 1A | 1S | 1

The language is L= {x $\in \{0, 1\}^+$ | x does not contain consecutive 0's}

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S $\rightarrow$ aSbScS | aScSbS | bSaScS | bScSaS | cSaSbS | cSbSaS | λ

The language is L= {x $\in${a, b, c}* | $n_a(x) = n_b(x) = n_c(x)$}

===

S $\rightarrow$ AB

A $\rightarrow$ A1 | 0

B $\rightarrow$ 2B | 3

The language is $L = \{01^m 2^n 3 : \quad n, m \geq 1\}$

===

S $\rightarrow$ aSa | bSb | λ

The language of even length palindromes over alphabet {a,b}

===

S $\rightarrow$ aSa | bSb | a | b

The language of odd length palindromes over alphabet {a,b}

===

S $\rightarrow$ aSb | bSa | λ

Clearly, here minimum length string is λ

Other possibility

S $\Rightarrow$ aSb

$\Rightarrow$ a**bSa**b (S $\rightarrow$ bSa)

$\Rightarrow$ ab**bSa**ab (S $\rightarrow$ bSa)

$\Rightarrow$ abb**aSb**aab (S $\rightarrow$ aSb)

$\Rightarrow$ abba**aSb**baab (S $\rightarrow$ aSb)

$\Rightarrow$ abbaabbaab (S $\rightarrow$ λ)

Now the string obtained is "abbaabbaab**"**, if we interchange a's and b's of the string, then we get "baabbaabba" which is reverse of the obtained string "abbaabbaab**"**.

Hence the language represented by the grammar is
The set of even length string w over input alphabet {a,b} such that w^R is obtained from w by reversing a's and b's.

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S $\rightarrow$ aSa | bSb | aAb | bAa

A $\rightarrow$ aAa | bAb | a | b | λ

Here minimum length string is ab or ba

Other possibility

S $\Rightarrow$ bSb

$\Rightarrow$ b**bAa**b (S $\rightarrow$ bAa)

$\Rightarrow$ bb**aAa**ab (A $\rightarrow$ aAa)

$\Rightarrow$ bba**bAb**aab (A $\rightarrow$ bAa)

$\Rightarrow$ bbabbaab (A $\rightarrow$ λ)

Now the string obtained is "bbab**baab"**, if we interchange one a from the last half of the string "**baab**" , then we get "**babb**" which is reverse of the first half "bbab".

Similarly,

$S \Rightarrow bSb$
$\Rightarrow$ b**aAb**b ($S \rightarrow aAb$)
$\Rightarrow$ ba**aAa**bb ($A \rightarrow aAa$)
$\Rightarrow$ baa**bAb**abb ($A \rightarrow bAa$)
$\Rightarrow$ baabbabb ($A \rightarrow \lambda$)

Now the string obtained is "baab**babb"**, if we interchange one b from the last half of the string "**babb**" , then we get "**baab**" which is reverse of the first half "baab".

Hence the language represented by the grammar is
The set of even length string over input alphabet {a,b} that are not palindromes but could be made into palindromes by changing one symbol from a to b or vice versa
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$S \rightarrow aS \mid bS \mid a$
The language represented by grammar is {a, b}*a
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$S \rightarrow aS \mid bS \mid a \mid b$
The language is L= $\{a, b\}^+$
==

$S \rightarrow SS \mid bS \mid a$
The language is L= $\{a, b\}^*a$
==

$S \rightarrow SaS \mid b$
The language is L= (ba)*b
==

$S \rightarrow aT \mid bT \mid \lambda$
$T \rightarrow aS \mid bS$
Clearly, here minimum length string is λ
Other possibility
$S \Rightarrow aT$
$\Rightarrow$ a**bS** ($T \rightarrow bS$)
$\Rightarrow$ ab**aT** ($S \rightarrow aT$)
$\Rightarrow$ aba**aS** ($T \rightarrow aS$)
$\Rightarrow$ abaa**bT** ($S \rightarrow bT$)
$\Rightarrow$ abaab**aS** ($T \rightarrow aS$)
$\Rightarrow$ abaaba ($S \rightarrow \lambda$)

Hence the language represented by the grammar is
The set of even length strings over alphabet {a,b}
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