CSCI 150 – Homework 6 Solution

1.

S → AD
A → EC
B → AE
C → EF
D → BE
E → a
F → b

2a

b
c. 

![Diagram showing states and transitions in a PDA]

\[ \lambda \text{ symbols mean empty string.} \]

d. 

Using the similar idea from c, PDA can be constructed by turning the language into two cases where the string begins with a and string begins with b.
3.

S → AB
A → BB
A → a
B → AB
B → b

aabba

<table>
<thead>
<tr>
<th>i \ j</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>∅</td>
<td>B</td>
<td>A</td>
<td>∅</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>∅</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>B</td>
<td>A</td>
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<tr>
<td>4</td>
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<td></td>
<td>B</td>
<td>∅</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>A</td>
<td></td>
</tr>
</tbody>
</table>

Therefore ‘aabba’ cannot be generated.