This homework relates to the following program.

```
start:    j B
A:        lw $8, 0($4)
          addi $8, $8, 1
          sw $8, 0($4)
          addi $4, $4, 4
          addi $5, $5, -1
B:        slt $2, $5, $0
          beq $2, $0, A
```

memory is initialized to 0, except addresses 0x10010000 - 0x10010100 which have data values in them.

registers are initialized to 0, except the following:

- $4 has the value 0x10010000
- $5 has the value 10 (decimal)

1. (2 points) what does this code do?

2. (18 points, 3 each) Complete the following table for the execution of this program. In the case of pipelined processors, assume all possible forwarding, speculative execution, and predictors initialized to not-taken.

<table>
<thead>
<tr>
<th>Processor</th>
<th>Clock (MHz)</th>
<th>Cycles</th>
<th>CPI</th>
<th>Runtime (ns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Cycle</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-Cycle</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipelined</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Prediction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1-cycle stall)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>predict not taken</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-bit predictor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-bit predictor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

40
40
38
38

$4 has the value 0x10010000
$5 has the value 10 (decimal)

Attach additional pages showing your work.