Wyatt Tack

CPE-333

**Quiz Week 3: Pipelining Basic Problems**

1. How many clock cycles to execute the following 5 instructions No Forwarding

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Clock: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| add x1w x2r x0r | IF | DEC | ALU | DM | WB |  |  |  |  |  |  |  |  |  |  |
| sub x1w x2r x1r |  | IF | DEC | DEC | DEC | ALU | DM | WB |  |  |  |  |  |  |  |
| lw x3w 0(x1r) |  |  | IF | IF | IF | DEC | DEC | DEC | ALU | DM | WB |  |  |  |  |
| sw x4r 0(x3r) |  |  |  |  |  | IF | IF | IF | DEC | DEC | DEC |  |  |  |  |
| add x1w x2r x2r |  |  |  |  |  |  |  |  | IF | IF | IF | DEC | ALU | DM | WB |

1. The 5 instructions will take 15 clock cycles

2 How many clock cycles to execute the following instructions no forwarding

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Clock: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| beq x1r x2r label | IF | DEC | ALU | DM |  |  |  |  |
| add x1w x2r x3r |  | IF | DEC | ALU |  |  |  |  |
| sub x1w x2r x4r |  |  | IF | DEC |  |  |  |  |
| add x5w x6r x7r |  |  |  |  |  |  |  |  |
| label: exit |  |  |  | IF | DEC | ALU | DM | WB |

1. The 5 instructions will take 8 clock cycles