ALU control:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Inputs | | | | Outputs | | | | | |
| Instruction Type | OP code | FUN code | Instruction | ALUOP | | | | | STLU |
|  |  |  |  | Binary | | | | HEX |  |
| R | 0 | 0 | ADD | 0 | 0 | 0 | 0 | 0 | X |
| I | 4 | X | ADDI | 0 | 0 | 0 | 0 | 0 | X |
| I | 16 | X | LW | 0 | 0 | 0 | 0 | 0 | X |
| I | 17 | X | SW | 0 | 0 | 0 | 0 | 0 | X |
| J | 22 | X | JALR | 0 | 0 | 0 | 0 | 0 | X |
| R | 0 | 1 | SUB | 0 | 0 | 0 | 1 | 1 | X |
| I | 18 | X | BEQ | 0 | 0 | 0 | 1 | 1 | X |
| I | 19 | X | BNE | 0 | 0 | 0 | 1 | 1 | X |
| R | 1 | 0 | XOR | 0 | 1 | 0 | 0 | 4 | X |
| I | 8 | X | XORI | 0 | 1 | 0 | 0 | 4 | X |
| R | 1 | 1 | OR | 0 | 1 | 0 | 1 | 5 | X |
| I | 9 | X | ORI | 0 | 1 | 0 | 1 | 5 | X |
| R | 1 | 2 | AND | 0 | 1 | 1 | 0 | 6 | X |
| I | 10 | X | ANDI | 0 | 1 | 1 | 0 | 6 | X |
| R | 1 | 3 | NOR | 0 | 1 | 1 | 1 | 7 | X |
| I | 11 | X | NORI | 0 | 1 | 1 | 1 | 7 | X |
| R | 2 | 0 | SLL | 1 | 0 | 0 | 0 | 8 | X |
| I | 12 | X | SLLI | 1 | 0 | 0 | 0 | 8 | X |
| R | 2 | 1 | SRL | 1 | 0 | 0 | 1 | 9 | X |
| I | 13 | X | SRLI | 1 | 0 | 0 | 1 | 9 | X |
| R | 2 | 2 | SRA | 1 | 0 | 1 | 0 | 10 | X |
| I | 14 | X | SRAI | 1 | 0 | 1 | 0 | 10 | X |
| R | 2 | 3 | ROR | 1 | 0 | 1 | 1 | 11 | X |
| I | 15 | X | RORI | 1 | 0 | 1 | 1 | 11 | X |
| R | 0 | 2 | SLT | 1 | 1 | 0 | 1 | 12 | 0 |
| I | 6 | X | SLTI | 1 | 1 | 0 | 1 | 12 | 0 |
| I | 20 | X | BLT | 1 | 1 | 0 | 1 | 12 | X |
| I | 21 | X | BGE | 1 | 1 | 0 | 1 | 12 | X |
| R | 0 | 3 | SLTU | 1 | 1 | 0 | 1 | 12 | 1 |
| I | 7 | X | SLTIU | 1 | 1 | 0 | 1 | 12 | 1 |
| J | 23 | X | LUI | 1 | 1 | 1 | 1 | 15 | X |
| J | 24 | X | J | 1 | 1 | 1 | 1 | 15 | X |
| J | 25 | X | JAL | 1 | 1 | 1 | 1 | 15 | X |

Main control:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Inputs | | Outputs | | | | | | |
| OP Code | Instruction | RegDst | RegW | Ext | ALUSRC | MEMR | MEMW | WBData |
| 0-2 | R-Type | 1 | 1 | X | 0 | 0 | 0 | 0 |
| 4 | ADDI | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 6 | SLTI | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 7 | SLTIU | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 8 | XORI | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 9 | ORI | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 10 | ANDI | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 11 | NORI | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 12 | SLLI | 0 | 1 | X | 1 | 0 | 0 | 0 |
| 13 | SRLI | 0 | 1 | X | 1 | 0 | 0 | 0 |
| 14 | SRAI | 0 | 1 | X | 1 | 0 | 0 | 0 |
| 15 | RORI | 0 | 1 | X | 1 | 0 | 0 | 0 |
| 16 | LW | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| 17 | SW | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| 18 | BEQ | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 19 | BNE | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 20 | BLT | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 21 | BGE | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 22 | JALR | 0 | 1 | 1 | X | 0 | 0 | 3 |
| 23 | LUI | 2 | 1 | X | X | 0 | 0 | 2 |
| 24 | J | X | 0 | X | X | 0 | 0 | 0 |
| 25 | JAL | 3 | 1 | X | X | 0 | 0 | 3 |

PC control

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Inputs | | | | Outputs | |
| OP Code | Instruction | Zero | Less | PCSRC | LinkReg |
| 0-2 | R-Type | X | X | 0 | 0 |
| 24,25 | J-Type | X | X | 2 | 0 |
| 22 | JALR | X | X | 1 | 1 |
| 4,6-17,23 | X | X | X | 0 | 0 |
| 18 | BEQ | 0 | X | 0 | 0 |
| 18 | BEQ | 1 | X | 1 | 0 |
| 19 | BNE | 0 | X | 1 | 0 |
| 19 | BNE | 1 | X | 0 | 0 |
| 20 | BLT | X | 1 | 1 | 0 |
| 20 | BLT | X | 0 | 0 | 0 |
| 21 | BGE | X | 1 | 0 | 0 |
| 21 | BGE | X | 0 | 1 | 0 |