TRUTH TABLE:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | R-type | Lw | Sw | Beq | Bne | Addi | Ori | Andi | lui |
| Branch[1-0] | 00 | 00 | 00 | 10 | 11 | 00 | 00 | 00 | 00 |
| MemRead | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| MemtoReg | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| ALUctrl | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| MemWrite | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| ALUSrc | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| Regwrite | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| ImmGen[1-0] | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

R-type:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Branch  [1-0] | MemRead | MemtoReg | ALUctrl  [4-0] | MemWrite | ALUSrc | Regwrite | ImmGen  [1-0] | Funct7 | Funct3 | opcode |
| ADD | 00 | 0 | 0 | 00000 | 0 | 0 | 1 | X | 0000000 | 000 | 0110011 |
| SUB | 00 | 0 | 0 | 00100 | 0 | 0 | 1 | X | 0100000 | 000 | 0110011 |
| AND | 00 | 0 | 0 | 00010 | 0 | 0 | 1 | X | 0000000 | 111 | 0110011 |
| OR | 00 | 0 | 0 | 00011 | 0 | 0 | 1 | X | 0000000 | 110 | 0110011 |
| SLL | 00 | 0 | 0 | 00001 | 0 | 1 | 1 | X | 0000000 | 001 | 0110011 |
| SLR | 00 | 0 | 0 | 01001 | 0 | 1 | 1 | X | 0000000 | 101 | 0110011 |

I-type:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Branch  [1-0] | MemRead | MemtoReg | ALUctrl  [4-0] | MemWrite | ALUSrc | Regwrite | ImmGen  [1-0] | Funct7 | Funct3 | Opcode |
| ADDI | 00 | 0 | 0 | 00000 | 0 | 1 | 1 | 01 | X | 000 | 0010011 |
| ORI | 00 | 0 | 0 | 00011 | 0 | 1 | 1 | 01 | 0000000 | 110 | 0010011 |
| ANDI | 00 | 0 | 0 | 00010 | 0 | 1 | 1 | 01 | 0000000 | 111 | 0010011 |
| LW | 00 | 1 | 1 | 01110 | 0 | 1 | 1 | 01 | 0000000 | 010 | 0000011 |
| SLLI | 00 | 0 | 0 | 00001 | 0 | 1 | 1 | 01 | 0000000 | 001 | 0010011 |
| SLRI | 00 | 0 | 0 | 01001 | 0 | 1 | 1 | 01 | 0000000 | 101 | 0010011 |

S-type:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Branch  [1-0] | MemRead | MemtoReg | ALUctrl  [4-0] | MemWrite | ALUSrc | Regwrite | ImmGen  [1-0] | Funct7 | Funct3 | Opcode |
| SW | 00 | 0 | 0 | 10101 | 1 | 1 | 0 | 10 | x | 010 | 0100011 |

B-type:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Branch  [1-0] | MemRead | MemtoReg | ALUctrl  [4-0] | MemWrite | ALUSrc | Regwrite | ImmGen  [1-0] | Funct7 | Funct3 | opcode |
| BEQ | 01 | 0 | 0 | 10000 | 0 | 0 | 0 | 00 | X | 000 | 1100011 |
| BNE | 10 | 0 | 0 | 01000 | 0 | 0 | 0 | 00 | x | 001 | 1100011 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Branch  [1-0] | MemRead | MemtoReg | ALUctrl  [4-0] | MemWrite | ALUSrc | Regwrite | ImmGen  [1-0] | Funct7 | Funct3 | opcode |
| LUI | 00 | 0 | 0 | 01111 | 0 | 1 | 1 | 11 | x | x | 0110111 |

U-type:

For Immgen:

|  |  |
| --- | --- |
| Instruction type | ImmGen value |
| B type | 00 |
| I type | 01 |
| S type | 10 |
| U type | 11 |