[R-type]

**IF - 1**

IR <= MEM[PC]

ALUout <= PC+4

**ID - 2**

PC <= ALUout

A <= RF[IR[19:15]]

B <= RF[IR[24:20]]

ALUout <= PC + (sign-extend(IMM)))

**EX - 7**

ALUout <= A OP B

**WB - 11**

RF[IR[11:7]] <= ALUout

[I-type]

**IF - 1**

IR <= MEM[PC]

ALUout <= PC+4

**ID - 2**

PC <= ALUout

A <= RF[IR[19:15]]

B <= RF[IR[24:20]]

ALUout <= PC + (sign-extend(IMM)))

**EX - 5**

ALUout <= A OP sign-extend[IMM]

**WB - 11**

RF[IR[11:7]] <= ALUout

[LW]

**IF - 1**

IR <= MEM[PC]

ALUout <= PCn+4

**ID - 2**

PC <= ALUout

A <= RF[IR[19:15]]

B <= RF[IR[24:20]]

ALUout <= PC + (sign-extend(IMM)))

**EX - 5**

ALUout <= A + sign-extend(IMM)

**MEM - 12**

MEM[ALUout]

**WB - 6**

RF[IR[11:7]] <= MEM[ALUout]

[SW]

**IF - 1**

IR <= MEM[PC]

ALUout <= PC+4

**ID - 2**

PC <= ALUout

A <= RF[IR[19:15]]

B <= RF[IR[24:20]]

ALUout <= PC + (sign-extend(IMM)))

**EX - 5**

ALUout <= A + sign-extend(IMM)

**MEM - 4**

MEM[ALUout] <= B

[JAL]

**IF - 1**

IR <= MEM[PC]

ALUout <= PC+4

**ID – 2**

PC <= ALUout

A <= RF[IR[19:15]]

B <= RF[IR[24:20]]

ALUout <= PC + (sign-extend(IMM)))

**EX - 3**

PC <= ALUout

ALUout <= PC + 0

**WB - 11**

RF[IR[11:7]] <= ALUout

[JALR]

**IF - 1**

IR <= MEM[PC]

ALUout <= PC+4

**ID - 2**

PC <= ALUout

A <= RF[IR[19:15]]

B <= RF[IR[24:20]]

ALUout <= PC + (sign-extend(IMM)))

**EX - 8**

PC <= (A + sign-extend(IMM)) & 0xfffffffe

ALUout <= PC + 0

**WB - 11**

RF[IR[11:7]] <= ALUout

[BR]

**IF - 1**

IR <= MEM[PC]

ALUout <= PC+4

**ID - 2**

PC <= ALUout

A <= RF[IR[19:15]]

B <= RF[IR[24:20]]

ALUout <= PC + (sign-extend(IMM)))

**EX - 9**

PC <= ALUout if condition met

**WB - 10**

**DUMMY (**PC+4**)**