

## Appendix B: Control Flow Table

State #	Name	opcode_s2	comp_rslt_s1	addr_sel_s1	Mem_Wrt_s1	ir_wrt_s1	opA_sel_s1	opB_sel_s1	alu_op_s1	pc_sel_s2	regA_sel_s2	data_sel_s2	reg_wrt_s2	pc_wrt_s2	Description
1 (000)	Idle	xxxx	x	x	x	x	x	xxxx	xxxxxxxx	0	x	xxx	0	1	Load PC = 0 and wait for reset_s1 = 0
2 (010)	Fetch	xxxx	x	0	0	1	1	0010	00000001	x	x	xxx	x	x	Load IR with Instruction from Memory & PC + 1 -> ALU Out
	ALU Op	0xxx	x	x	x	x	x	xxxx	xxxxxxxx	1	0	xxx	0	1	Write PC + 1 & Load Rs/Rt in opA/opB registers
	Load Imm	1000	x	x	x	x	x	xxxx	xxxxxxxx	1	x	xxx	0	1	Write PC + 1
	LW	1001	x	x	x	x	x	xxxx	xxxxxxxx	1	0	xxx	0	1	Write PC + 1 & Load Rt in opA register
	SW	1010	x	x	x	x	x	xxxx	xxxxxxxx	1	1	xxx	0	1	Write PC + 1 & Load Rs/Rt in opA/opB registers
	BEQZ	1011	x	x	x	x	x	xxxx	xxxxxxxx	1	1	xxx	0	1	Write PC + 1 & Load Rs in opA register
	BNEZ	1100	x	x	x	x	x	xxxx	xxxxxxxx	1	1	xxx	0	1	Write PC + 1 & Load Rs in opA register
	JAL	1101	x	x	x	x	x	xxxx	xxxxxxxx	1	x	100	1	1	Write PC + 1 & Store in Register File as Return Addr & Load 8-bit Offset
	JMP	1110	x	x	x	x	x	xxxx	xxxxxxxx	1	x	xxx	0	1	Write PC + 1 & Load 8-bit Offset
	JR	1111	x	x	x	x	x	xxxx	xxxxxxxx	1	0	xxx	0	1	Write PC + 1 & Load Rs in opA register
3 (100)	ALU Op	0xxx	x	x	0	0	0	0001	ALU OP	x	x	xxx	x	x	Select OutA and OutB for ALU op & store in ALU out
	Load Imm	1000	x	x	0	0	x	xxxx	xxxxxxxx	x	x	xxx	x	x	No Operation on this cycle
	LW	1001	x	1	0	0	0	0100	00000001	x	x	xxx	x	x	Select OutA and 0 for ALU add for Mem addr read -> MDR
	SW	1010	x	1	1	0	0	0100	00000001	x	x	xxx	x	x	Select OutA and 0 for ALU add for Mem addr write with OutB data
	BEQZ	1011	x	x	0	0	1	1000	00000001	x	x	xxx	x	x	Select PCout and Offset for ALU add for new branch address
	BNEZ	1100	x	x	0	0	1	1000	00000001	x	x	xxx	x	x	Select PCout and Offset for ALU add for new branch address
	JAL	1101	x	x	0	0	1	1000	00000001	x	x	xxx	x	x	Select PCout and Offset for ALU add for new jump address
	JMP	1110	x	x	0	0	1	1000	00000001	x	x	xxx	x	x	Select PCout and Offset for ALU add for new jump address
	JR	1111	x	x	0	0	0	0100	00000001	x	x	xxx	x	x	Select PCout ALU add 0 for new jump return address
	ALU Op	0xxx	x	x	x	x	x	xxxx	xxxxxxxx	x	x	100	1	0	Select ALU output for Write to Register File
	Load Imm	1000	x	x	x	x	x	xxxx	xxxxxxxx	x	x	001	1	0	Select IR Imm output for Write to Register File
	LW	1001	x	x	x	x	x	xxxx	xxxxxxxx	x	x	010	1	0	Select MDR data out for Write to Register File
	SW	1010	x	x	x	x	x	xxxx	xxxxxxxx	x	x	xxx	0	0	No operation
	BEQZ	1011	0	x	x	x	x	xxxx	xxxxxxxx	1	x	xxx	0	1	Branch is taken based on comp_rslt_s1; Write new PC from ALU out
		1011	1	x	x	x	x	xxxx	xxxxxxxx	x	x	xxx	0	0	Branch not taken; No operation
	BNEZ	1100	0	x	x	x	x	xxxx	xxxxxxxx	x	x	xxx	0	0	Branch not taken; No operation
		1100	1	x	x	x	x	xxxx	xxxxxxxx	1	x	xxx	0	1	Branch is taken based on comp_rslt_s1; Write new PC from ALU out
	JAL	1101	x	x	x	x	x	xxxx	xxxxxxxx	1	x	xxx	0	1	Write new PC from ALU out
	JMP	1110	x	x	x	x	x	xxxx	xxxxxxxx	1	x	xxx	0	1	Write new PC from ALU out
	JR	1111	x	x	x	x	x	xxxx	xxxxxxxx	1	x	xxx	0	1	Write new PC from ALU out