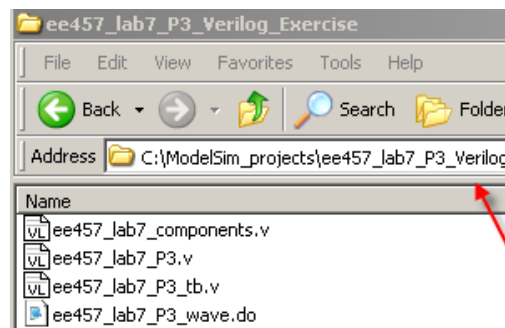


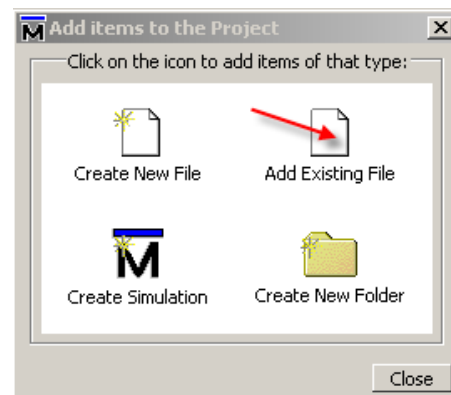
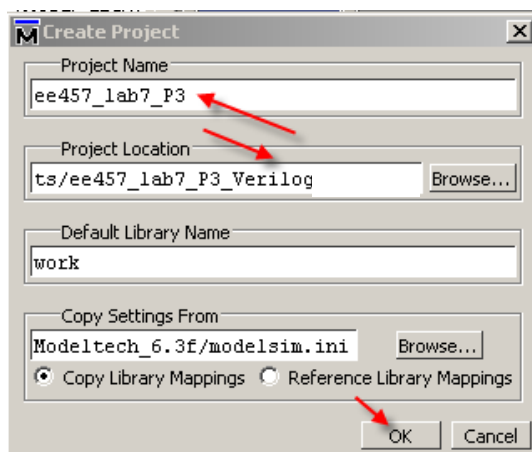
Design of a Simple Pipeline

Procedure Steps

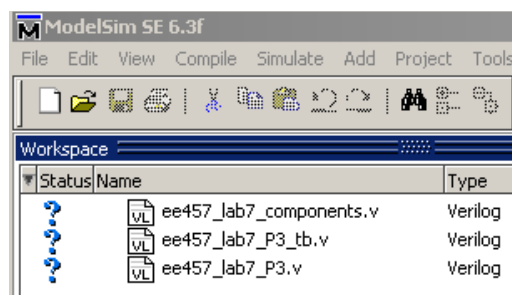
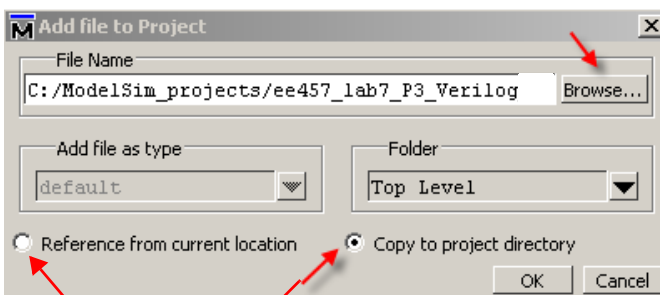
1. Create a folder C:\ModelSim_projects\ee457_lab7_P3_Verilog (under your C:\ModelSim_projects). Download the .zip file provided and extract the verilog and .do files and place them in the above directory.



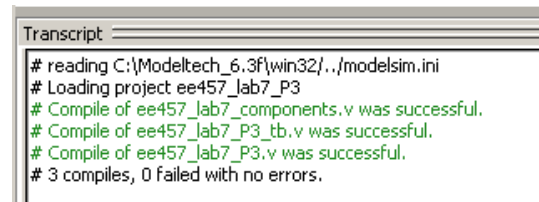
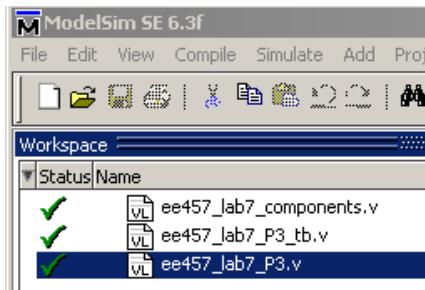
2. Create a modelsim project with the project name ee457_lab7_P3 and project directory same as the above.



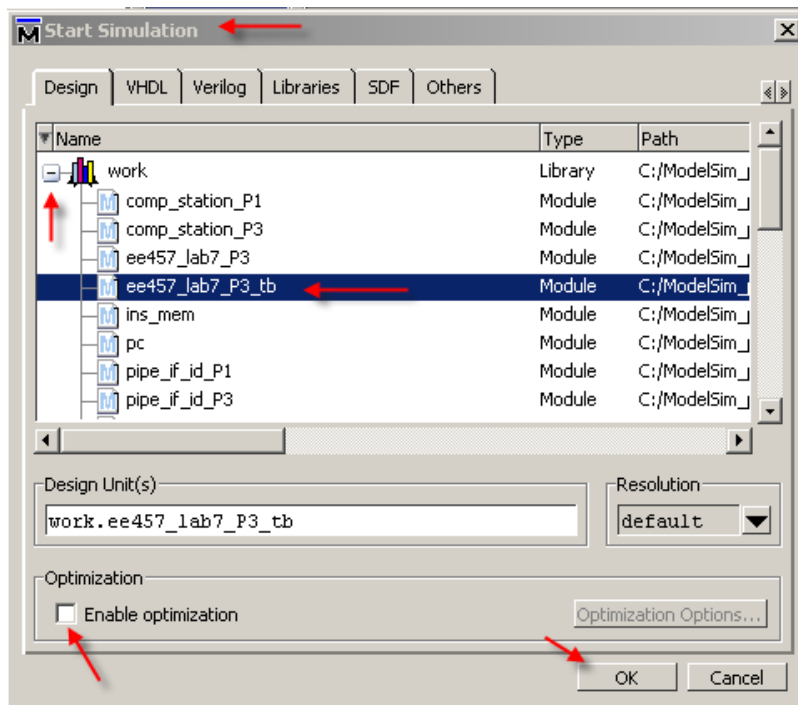
3. Edit (in Notepad++) and complete the ee457_lab7_P3.v. Add all verilog files to the project.



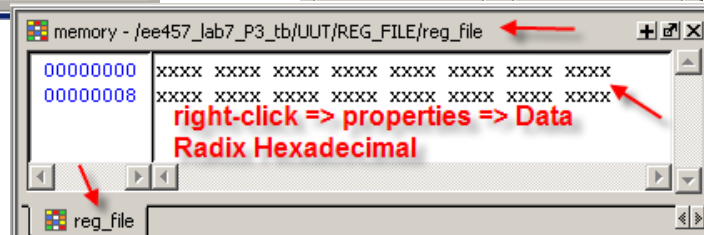
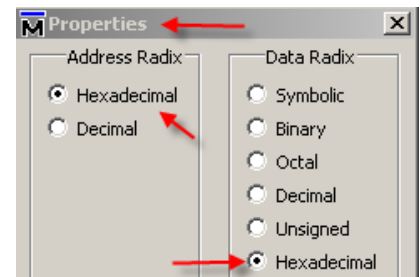
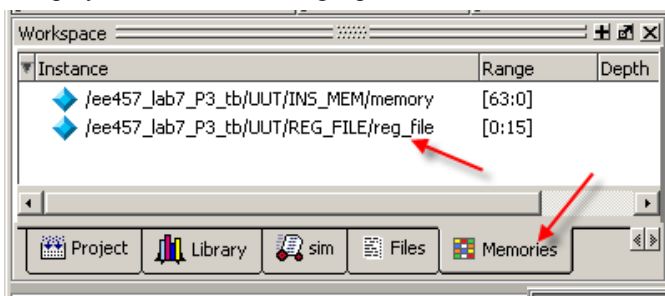
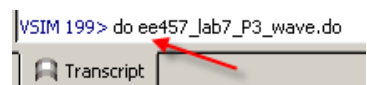
4. Compile all Verilog files.



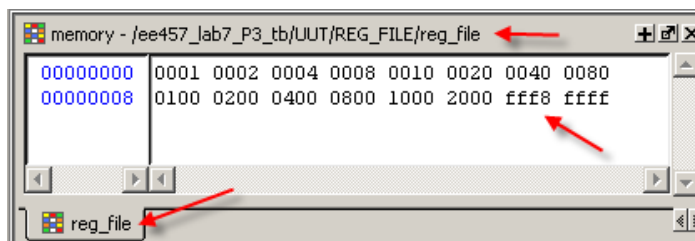
5. Start simulation by selecting ee457_lab7_P3_tb
Simulate => Start Simulation



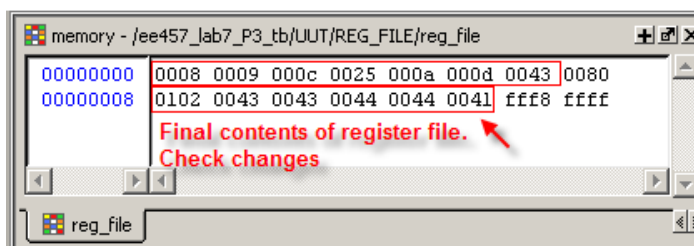
6. Use the given wave.do file (ee457_lab7_P3_wave.do) to set up the waveform.
7. Select the Memories tab in the workspace and double click on the reg_file to display its contents in the right pane.



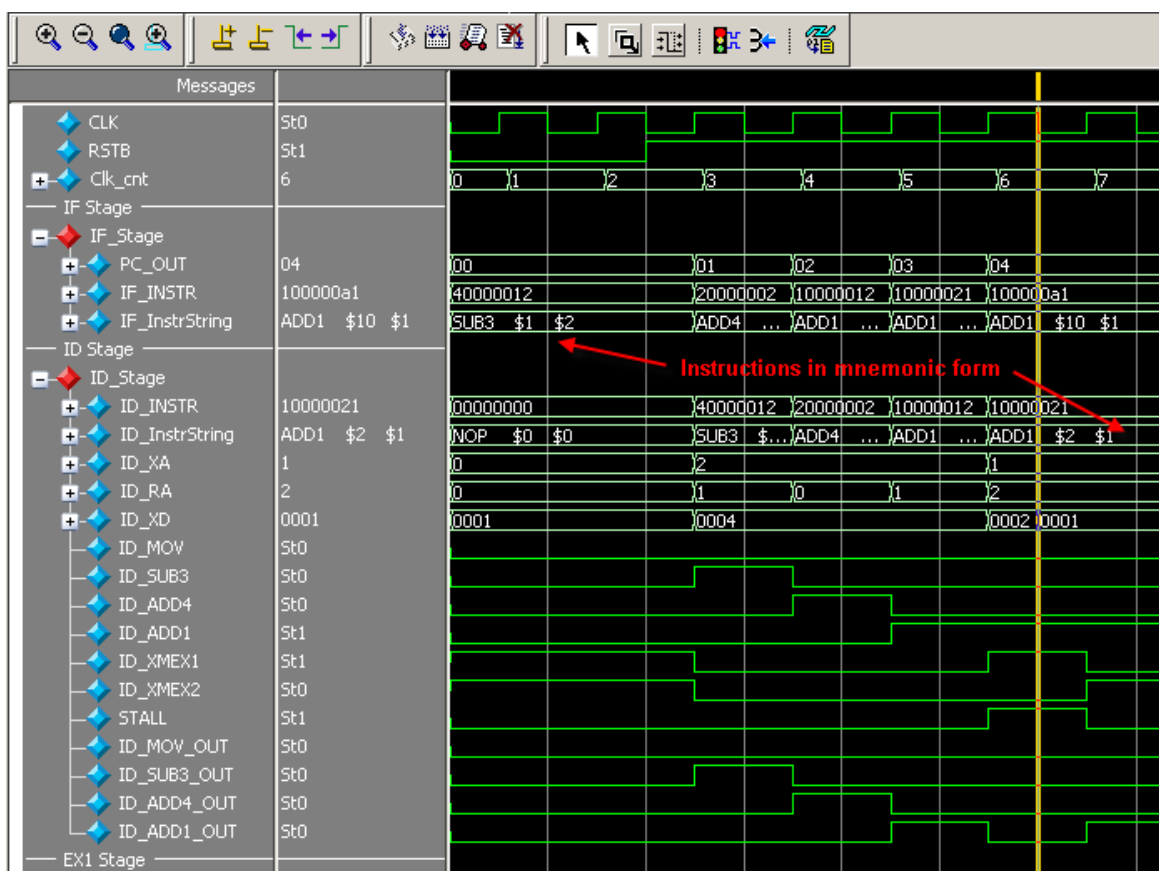
8. Initially the data content of the memory is displayed as xxxx. You can simulate for a very short time (say 1ns) (run 1ns) | `VSIM 200> run 1ns` to display the actual initial contents.



9. Run the simulation for 1199ns more (total 1200ns) | `VSIM 15> run 1199ns`



10. Verify the final contents. Look at the waveform to see if some signals are misbehaving. Perform incremental simulation to find the errors. Use **restart -f** to start the simulation again from 0ns.
11. The finished waveform should look like this.



12. Using Notepad++, inspect the output file generated, TimeSpace.txt. They appear similar to the ones below.
Good luck!

TimeSpace.txt																	Lab 7 Part 3 Subpart 1
1	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
2	CLK#	IF	ID	EX1	EX2	WB											
3	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
4	0	RESET	RESET	RESET	RESET	RESET											
5	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
6	1	RESET	RESET	RESET	RESET	RESET											
7	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
8	2	SUB3 \$1 \$2	NOP \$0 \$0	NOP \$0 \$0	NOP \$0 \$0	NOP \$0 \$0											
9	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
10	3	ADD4 \$0 \$2	SUB3 \$1 \$2	NOP \$0 \$0	NOP \$0 \$0	NOP \$0 \$0											
11	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
12	4	ADD1 \$1 \$2	ADD4 \$0 \$2	SUB3 \$1 \$2	NOP \$0 \$0	NOP \$0 \$0											
13	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
14	5	ADD1 \$2 \$1	ADD1 \$1 \$2	ADD4 \$0 \$2	SUB3 \$1 \$2	NOP \$0 \$0											
15	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
16	6	ADD1 \$10 \$1	ADD1 \$2 \$1	ADD1 \$1 \$2	ADD4 \$0 \$2	SUB3 \$1 \$2											
17	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
18	7	ADD1 \$10 \$1	ADD1 \$2 \$1	BUBBLE \$2 \$1	ADD1 \$1 \$2	ADD4 \$0 \$2											
19	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
20	8	SUB3 \$1 \$2	ADD1 \$10 \$1	ADD1 \$2 \$1	BUBBLE \$2 \$1	ADD1 \$1 \$2											
21	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
22	9	ADD1 \$2 \$1	SUB3 \$1 \$2	ADD1 \$10 \$1	ADD1 \$2 \$1	BUBBLE \$2 \$1											
23	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
24	10	ADD4 \$2 \$2	ADD1 \$2 \$1	SUB3 \$1 \$2	ADD1 \$10 \$1	ADD1 \$2 \$1											
25	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	

TimeSpace.txt																	Lab 7 Part 3 Subpart 2
1	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
2	CLK#	IF	ID	EX12	WB												
3	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
4	0	RESET	RESET	RESET	RESET												
5	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
6	1	RESET	RESET	RESET	RESET												
7	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
8	2	SUB3 \$1 \$2	NOP \$0 \$0	NOP \$0 \$0	NOP \$0 \$0												
9	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
10	3	ADD4 \$0 \$2	SUB3 \$1 \$2	NOP \$0 \$0	NOP \$0 \$0												
11	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
12	4	ADD1 \$1 \$2	ADD4 \$0 \$2	SUB3 \$1 \$2	NOP \$0 \$0												
13	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
14	5	ADD1 \$2 \$1	ADD1 \$1 \$2	ADD4 \$0 \$2	SUB3 \$1 \$2												
15	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
16	6	ADD1 \$10 \$1	ADD1 \$2 \$1	ADD1 \$1 \$2	ADD4 \$0 \$2												
17	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
18	7	ADD1 \$10 \$1	ADD1 \$2 \$1	ADD1 \$1 \$2	ADD4 \$0 \$2												
19	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
20	8	SUB3 \$1 \$2	ADD1 \$10 \$1	ADD1 \$2 \$1	ADD1 \$1 \$2												
21	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
22	9	SUB3 \$1 \$2	ADD1 \$10 \$1	ADD1 \$2 \$1	ADD1 \$1 \$2												
23	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	
24	10	ADD1 \$2 \$1	SUB3 \$1 \$2	ADD1 \$10 \$1	ADD1 \$2 \$1												
25	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	

