**LAB-3 Solution: ALU**

**module fa (input wire i0, i1, cin, output wire sum, cout);**

**wire t0, t1, t2;**

**xor3 \_i0 (i0, i1, cin, sum);**

**and2 \_i1 (i0, i1, t0);**

**and2 \_i2 (i1, cin, t1);**

**and2 \_i3 (cin, i0, t2);**

**or3 \_i4 (t0, t1, t2, cout);**

**endmodule**

**module addsub (input wire addsub, i0, i1, cin, output wire sumdiff, cout);**

**wire t;**

**fa \_i0 (i0, t, cin, sumdiff, cout);**

**xor2 \_i1 (i1, addsub, t);**

**endmodule**

**module alu\_slice (input wire [1:0] op, input wire i0, i1, cin, output wire o, cout);**

**wire t\_sumdiff, t\_and, t\_or, t\_andor;**

**addsub \_i0 (op[0], i0, i1, cin, t\_sumdiff, cout);**

**and2 \_i1 (i0, i1, t\_and);**

**or2 \_i2 (i0, i1, t\_or);**

**mux2 \_i3 (t\_and, t\_or, op[0], t\_andor);**

**mux2 \_i4 (t\_sumdiff, t\_andor, op[1], o);**

**endmodule**

**module alu (input wire [1:0] op, input wire [15:0] i0, i1, output wire [15:0] o, output wire cout);**

**wire [14:0] c;**

**alu\_slice \_i0 (op, i0[0], i1[0], op[0] , o[0], c[0]);**

**alu\_slice \_i1 (op, i0[1], i1[1], c[0], o[1], c[1]);**

**alu\_slice \_i2 (op, i0[2], i1[2], c[1], o[2], c[2]);**

**alu\_slice \_i3 (op, i0[3], i1[3], c[2], o[3], c[3]);**

**alu\_slice \_i4 (op, i0[4], i1[4], c[3], o[4], c[4]);**

**alu\_slice \_i5 (op, i0[5], i1[5], c[4], o[5], c[5]);**

**alu\_slice \_i6 (op, i0[6], i1[6], c[5], o[6], c[6]);**

**alu\_slice \_i7 (op, i0[7], i1[7], c[6], o[7], c[7]);**

**alu\_slice \_i8 (op, i0[8], i1[8], c[7], o[8], c[8]);**

**alu\_slice \_i9 (op, i0[9], i1[9], c[8], o[9], c[9]);**

**alu\_slice \_i10 (op, i0[10], i1[10], c[9] , o[10], c[10]);**

**alu\_slice \_i11 (op, i0[11], i1[11], c[10], o[11], c[11]);**

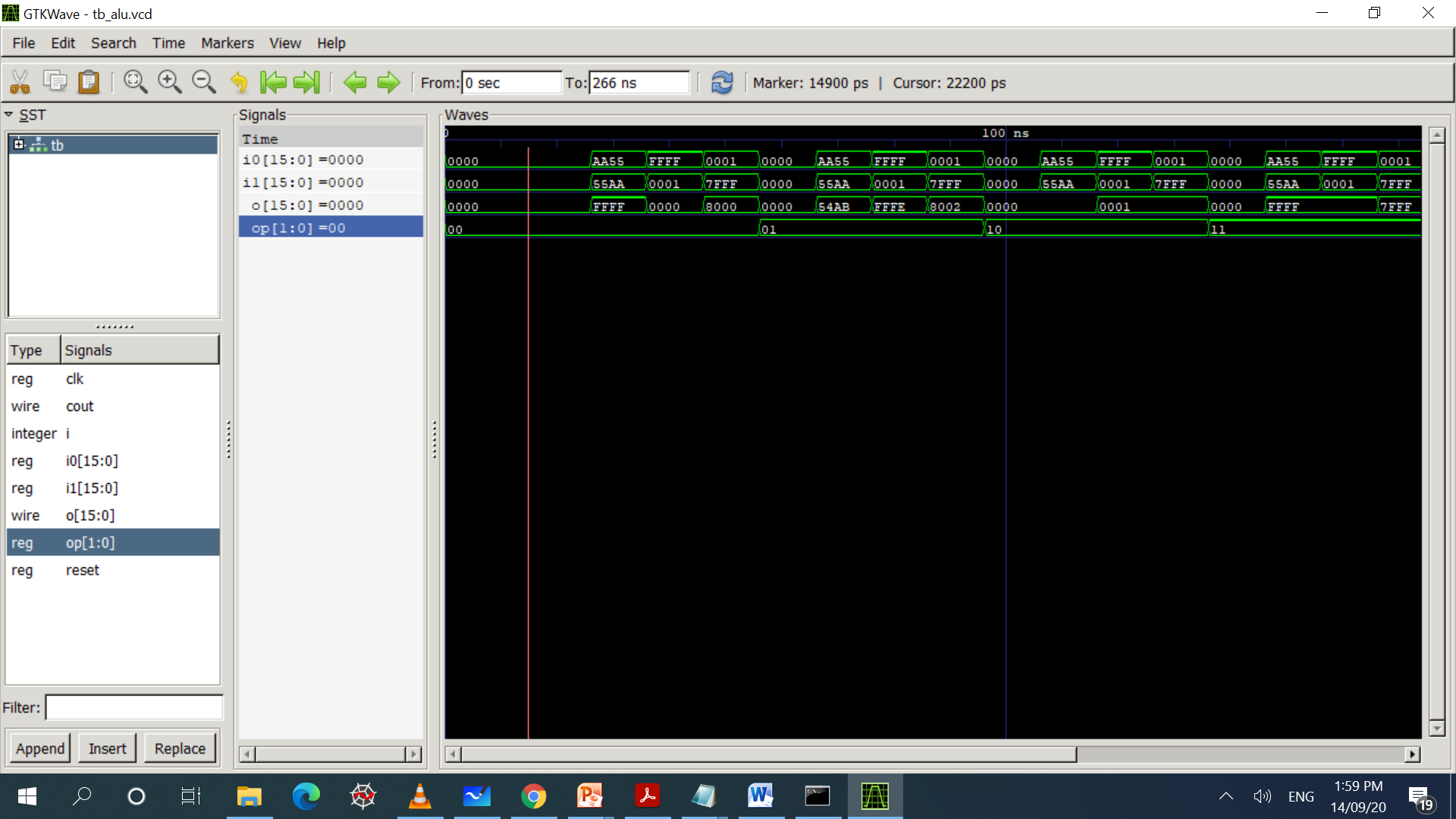
**alu\_slice \_i12 (op, i0[12], i1[12], c[11], o[12], c[12]);**

**alu\_slice \_i13 (op, i0[13], i1[13], c[12], o[13], c[13]);**

**alu\_slice \_i14 (op, i0[14], i1[14], c[13], o[14], c[14]);**

**alu\_slice \_i15 (op, i0[15], i1[15], c[14], o[15], cout);**

**endmodule**

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