BINSHADH BASHEER B210517CS

Q3

```
module signedmultiplier(output reg[7:0]out,input[3:0] a, b);
reg q;
reg [3:0]A;
reg [3:0]B;
always@(a,b)
begin
q=a[3];
out=b[3];
if(a[3]==1'b1)
begin
A[3]=a[3]^1'b1;
A[2]=a[2]^1'b1;
A[1]=a[1]^1'b1;
A[0]=a[0]^1'b1;
A=A+1'b1;
end
else
begin
A[3]=a[3];
A[2]=a[2];
A[1]=a[1];
A[0]=a[0];
end

if(b[3]==1'b1)
begin
B[3]=b[3]^1'b1;
B[2]=b[2]^1'b1;
B[1]=b[1]^1'b1;
B[0]=b[0]^1'b1;
```

```
B=B+1'b1;
end
else
begin
B[3]=b[3];
B[2]=b[2];
B[1]=b[1];
B[0]=b[0];
end
end

reg [7:0] r;
reg[2:0] i;
always @(a,b)
begin
r=0;
for(i=0;i<4;i=i+1)
begin
if(B[i]==1'b1)
begin
r = r+(A<<i);
end
end
end


always@(a,b)
begin
if(a[3]==b[3])
begin
out[7]=r[7]^1'b0;
out[6]=r[6]^1'b0;
out[5]=r[5]^1'b0;
out[4]=r[4]^1'b0;
out[3]=r[3]^1'b0;
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```
out[2]=r[2]^1'b0;
out[1]=r[1]^1'b0;
out[0]=r[0]^1'b0;


end
else
begin
out[7]=r[7]^1'b1;
out[6]=r[6]^1'b1;
out[5]=r[5]^1'b1;
out[4]=r[4]^1'b1;
out[3]=r[3]^1'b1;
out[2]=r[2]^1'b1;
out[1]=r[1]^1'b1;
out[0]=r[0]^1'b1;
out=out+1'b1;

end
end
endmodule
```

TEST BENCH

```
module tb;
wire [7:0]p;
reg [3:0]a;
reg [3:0]b;
integer i;
integer j;
signedmultiplier M(p,a,b);
initial
begin
for(i=0;i<16;i=i+1)
```

```
begin
for(j=0;j<16;j=j+1)
begin
#20
a=$random();
b=$random();
#20;
end
end
end
endmodule
```