Problem 7: [20 points] Drill problem
Filename: hw2prob7.sv

```
 1 `default_nettype none
 2
 3 module hw2prob7_if
 4   (output logic [2:0] Y,
 5    output logic valid,
 6    input logic [7:0] A);
 7
 8    always_comb begin
 9      valid = 1;
10      Y[2] = 0;
11      Y[1] = 0;
12      Y[0] = 0;
13      if (A[7])
14        begin
15          Y[2] = 1;
16          Y[1] = 1;
17          Y[0] = 1;
18        end
19      else if (A[6])
20        begin
21          Y[2] = 1;
22          Y[1] = 1;
23          Y[0] = 0;
24        end
25      else if (A[5])
26        begin
27          Y[2] = 1;
28          Y[1] = 0;
29          Y[0] = 1;
30        end
31      else if (A[4])
32        begin
33          Y[2] = 1;
34          Y[1] = 0;
35          Y[0] = 0;
36        end
37      else if (A[3])
38        begin
39          Y[2] = 0;
40          Y[1] = 1;
41          Y[0] = 1;
42        end
43      else if (A[2])
44        begin
45          Y[2] = 0;
46          Y[1] = 1;
47          Y[0] = 0;
48        end
49      else if (A[1])
50        begin
51          Y[2] = 0;
52          Y[1] = 0;
53          Y[0] = 1;
54        end
55      else
56        begin
57          valid = 0;
58        end
59    end
60 endmodule: hw2prob7_if
61
62 module hw2prob7_case
63   (output logic [2:0] Y,
64    output logic valid,
65    input logic [7:0] A);
66
67    always_comb begin
68      valid = 1;
69      Y[2] = 0;
70      Y[1] = 0;
```

```
 71      Y[0] = 0;
 72
 73      unique casez ({A[7], A[6], A[5], A[4], A[3], A[2], A[1], A[0]})
 74        8'b1???????: begin
 75                       Y[2] = 1;
 76                       Y[1] = 1;
 77                       Y[0] = 1;
 78                     end
 79        8'b01??????: begin
 80                       Y[2] = 1;
 81                       Y[1] = 1;
 82                       Y[0] = 0;
 83                     end
 84        8'b001?????: begin
 85                       Y[2] = 1;
 86                       Y[1] = 0;
 87                       Y[0] = 1;
 88                     end
 89        8'b0001????: begin
 90                       Y[2] = 1;
 91                       Y[1] = 0;
 92                       Y[0] = 0;
 93                     end
 94        8'b00001???: begin
 95                       Y[2] = 0;
 96                       Y[1] = 1;
 97                       Y[0] = 1;
 98                     end
 99        8'b000001??: begin
100                       Y[2] = 0;
101                       Y[1] = 1;
102                       Y[0] = 0;
103                     end
104        8'b0000001?: begin
105                       Y[2] = 0;
106                       Y[1] = 0;
107                       Y[0] = 1;
108                     end
109        8'b00000001: begin
110                       Y[2] = 0;
111                       Y[1] = 0;
112                       Y[0] = 0;
113                     end
114     endcase
115   end
116
117 endmodule: hw2prob7_case
118
119 module hw2prob7_tern
120   (output logic [2:0] Y,
121    output logic valid,
122    input logic [7:0] A);
123
124    assign Y[2] = (A[7] | A[6] | A[5] | A[4]) ? 1 : 0;
125    assign Y[1] = (A[7] | A[6] | (~A[5] & ~A[4] & (A[3] | A[2]))) ? 1 : 0;
126    assign Y[0] = (A[7] | ((~A[7] & ~A[6]) & A[5]) |
127                   ((~A[7] & ~A[6] & ~A[5] & ~A[4]) & A[3]) |
128                   ((~A[7] & ~A[6] & ~A[5] & ~A[4]
129                  & ~A[3] & ~A[2]) & A[1]))
130                   ? 1 : 0;
131    assign valid = (A[7] | A[6] | A[5] | A[4] | A[3] | A[2] | A[1] | A[0]);
132 endmodule: hw2prob7_tern
133
134 module hw2prob7_test
135   (input logic [2:0] y,
136    input logic valid,
137    output logic [7:0] a);
138
139    initial begin
140      $monitor($time,,
141      "a7 = %b, a6 = %b, a5 = %b, a4 = %b, a3 = %b, \
```

```
142       a2 = %b, a1 = %b, a0 = %b, y2 = %b, y1 = %b, \
143       y0 = %b, valid = %b", a[7], a[6], a[5], a[4],
144       a[3], a[2], a[1], a[0], y[2], y[1], y[0], valid);
145
146      #5 a[7] = 1;
147      #5 a[3] = 1;
148      #5 a[6] = 1;
149         a[7] = 0;
150         a[3] = 0;
151      #5 a[5] = 1;
152      #5 a[6] = 0;
153      #5 a[4] = 1;
154      #5 a[5] = 0;
155      #5 a[3] = 1;
156      #5 a[4] = 0;
157      #5 a[2] = 1;
158      #5 a[3] = 0;
159      #5 a[1] = 1;
160      #5 a[2] = 0;
161      #5 a[0] = 1;
162      #5 a[1] = 0;
163      #5 a[0] = 0;
164    end
165 endmodule: hw2prob7_test
166
```

Problem 7: [20 points] Drill problem
Filename: hw2prob7out.txt

```
  1        "hw2prob7.sv", line 73, for system.j, at time     5.
  2                    5 a7 = 0, a6 = 0, a5 = 0, a4 = 0, a3 = 0, a2 = 0, a1 = 0, ...
Line length of 83 (max is 80)
  3        If: y2if = 0, y1if = 0, y0if = 0, validIf = 0
  4        Case: y2case = 0, y1case = 0,y0case = 0, validCase = 1
  5        Tern: y2tern = 0, y1tern = 0, y0tern = 0, validTern = 0
  6                   10 a7 = 1, a6 = 0, a5 = 0, a4 = 0, a3 = 0, a2 = 0, a1 = 0, ...
Line length of 83 (max is 80)
  7        If: y2if = 1, y1if = 1, y0if = 1, validIf = 1
  8        Case: y2case = 1, y1case = 1,y0case = 1, validCase = 1
  9        Tern: y2tern = 1, y1tern = 1, y0tern = 1, validTern = 1
 10                   15 a7 = 1, a6 = 0, a5 = 0, a4 = 0, a3 = 1, a2 = 0, a1 = 0, ...
Line length of 83 (max is 80)
 11        If: y2if = 1, y1if = 1, y0if = 1, validIf = 1
 12        Case: y2case = 1, y1case = 1,y0case = 1, validCase = 1
 13        Tern: y2tern = 1, y1tern = 1, y0tern = 1, validTern = 1
 14                   20 a7 = 0, a6 = 1, a5 = 0, a4 = 0, a3 = 0, a2 = 0, a1 = 0, ...
Line length of 83 (max is 80)
 15        If: y2if = 1, y1if = 1, y0if = 0, validIf = 1
 16        Case: y2case = 1, y1case = 1,y0case = 0, validCase = 1
 17        Tern: y2tern = 1, y1tern = 1, y0tern = 0, validTern = 1
 18                   25 a7 = 0, a6 = 1, a5 = 1, a4 = 0, a3 = 0, a2 = 0, a1 = 0, ...
Line length of 83 (max is 80)
 19        If: y2if = 1, y1if = 1, y0if = 0, validIf = 1
 20        Case: y2case = 1, y1case = 1,y0case = 0, validCase = 1
 21        Tern: y2tern = 1, y1tern = 1, y0tern = 0, validTern = 1
 22                   30 a7 = 0, a6 = 0, a5 = 1, a4 = 0, a3 = 0, a2 = 0, a1 = 0, ...
Line length of 83 (max is 80)
 23        If: y2if = 1, y1if = 0, y0if = 1, validIf = 1
 24        Case: y2case = 1, y1case = 0,y0case = 1, validCase = 1
 25        Tern: y2tern = 1, y1tern = 0, y0tern = 1, validTern = 1
 26                   35 a7 = 0, a6 = 0, a5 = 1, a4 = 1, a3 = 0, a2 = 0, a1 = 0, ...
Line length of 83 (max is 80)
 27        If: y2if = 1, y1if = 0, y0if = 1, validIf = 1
 28        Case: y2case = 1, y1case = 0,y0case = 1, validCase = 1
 29        Tern: y2tern = 1, y1tern = 0, y0tern = 1, validTern = 1
 30                   40 a7 = 0, a6 = 0, a5 = 0, a4 = 1, a3 = 0, a2 = 0, a1 = 0, ...
Line length of 83 (max is 80)
 31        If: y2if = 1, y1if = 0, y0if = 0, validIf = 1
 32        Case: y2case = 1, y1case = 0,y0case = 0, validCase = 1
 33        Tern: y2tern = 1, y1tern = 0, y0tern = 0, validTern = 1
 34                   45 a7 = 0, a6 = 0, a5 = 0, a4 = 1, a3 = 1, a2 = 0, a1 = 0, ...
Line length of 83 (max is 80)
 35        If: y2if = 1, y1if = 0, y0if = 0, validIf = 1
 36        Case: y2case = 1, y1case = 0,y0case = 0, validCase = 1
 37        Tern: y2tern = 1, y1tern = 0, y0tern = 0, validTern = 1
 38                   50 a7 = 0, a6 = 0, a5 = 0, a4 = 0, a3 = 1, a2 = 0, a1 = 0, ...
Line length of 83 (max is 80)
 39        If: y2if = 0, y1if = 1, y0if = 1, validIf = 1
 40        Case: y2case = 0, y1case = 1,y0case = 1, validCase = 1
 41        Tern: y2tern = 0, y1tern = 1, y0tern = 1, validTern = 1
 42                   55 a7 = 0, a6 = 0, a5 = 0, a4 = 0, a3 = 1, a2 = 1, a1 = 0, ...
Line length of 83 (max is 80)
 43        If: y2if = 0, y1if = 1, y0if = 1, validIf = 1
 44        Case: y2case = 0, y1case = 1,y0case = 1, validCase = 1
 45        Tern: y2tern = 0, y1tern = 1, y0tern = 1, validTern = 1
 46                   60 a7 = 0, a6 = 0, a5 = 0, a4 = 0, a3 = 0, a2 = 1, a1 = 0, ...
Line length of 83 (max is 80)
 47        If: y2if = 0, y1if = 1, y0if = 0, validIf = 1
 48        Case: y2case = 0, y1case = 1,y0case = 0, validCase = 1
 49        Tern: y2tern = 0, y1tern = 1, y0tern = 0, validTern = 1
 50                   65 a7 = 0, a6 = 0, a5 = 0, a4 = 0, a3 = 0, a2 = 1, a1 = 1, ...
Line length of 83 (max is 80)
 51        If: y2if = 0, y1if = 1, y0if = 0, validIf = 1
 52        Case: y2case = 0, y1case = 1,y0case = 0, validCase = 1
 53        Tern: y2tern = 0, y1tern = 1, y0tern = 0, validTern = 1
 54                   70 a7 = 0, a6 = 0, a5 = 0, a4 = 0, a3 = 0, a2 = 0, a1 = 1, ...
Line length of 83 (max is 80)
 55        If: y2if = 0, y1if = 0, y0if = 1, validIf = 1
 56        Case: y2case = 0, y1case = 0,y0case = 1, validCase = 1
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```
 57        Tern: y2tern = 0, y1tern = 0, y0tern = 1, validTern = 1
 58                  75 a7 = 0, a6 = 0, a5 = 0, a4 = 0, a3 = 0, a2 = 0, a1 = 1, ...
Line length of 83 (max is 80)
 59        If: y2if = 0, y1if = 0, y0if = 1, validIf = 1
 60        Case: y2case = 0, y1case = 0,y0case = 1, validCase = 1
 61        Tern: y2tern = 0, y1tern = 0, y0tern = 1, validTern = 1
 62                  80 a7 = 0, a6 = 0, a5 = 0, a4 = 0, a3 = 0, a2 = 0, a1 = 0, ...
Line length of 83 (max is 80)
 63        If: y2if = 0, y1if = 0, y0if = 0, validIf = 0
 64        Case: y2case = 0, y1case = 0,y0case = 0, validCase = 1
 65        Tern: y2tern = 0, y1tern = 0, y0tern = 0, validTern = 1
 66 RT Warning: No condition matches in 'unique case' statement.
 67         "hw2prob7.sv", line 73, for system.j, at time    85.
 68                  85 a7 = 0, a6 = 0, a5 = 0, a4 = 0, a3 = 0, a2 = 0, a1 = 0, ...
Line length of 83 (max is 80)
 69        If: y2if = 0, y1if = 0, y0if = 0, validIf = 0
 70        Case: y2case = 0, y1case = 0,y0case = 0, validCase = 1
 71        Tern: y2tern = 0, y1tern = 0, y0tern = 0, validTern = 0
 72           V C S   S i m u l a t i o n   R e p o r t
 73 Time: 85
 74 CPU Time:      0.180 seconds;       Data structure size:   0.0Mb
 75 Sun Feb  2 20:54:27 2020
```