

CND 212: Digital Testing and Verification

Assignment #: 01

Section #: 21

Submitted by:

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```
module prod con;
        typedef enum {MESSAGE, COMMAND, CONTROL} packet type;
 3
        typedef enum {HIGH, MEDIUM, LOW} priority type;
 4
 5
       typedef struct {
 6
          int ID;
 7
          time sent time;
 8
          packet_type packet_type;
 9
          priority type packet priority;
10
         bit [31:0] data;
11
       } packet t;
12
13
       mailbox mb = new();
14
15
        task producer();
16
          packet t packet1;
17
18
          repeat (20) begin
19
            packet1.ID = $urandom_range(1, 200);
20
            packet1.sent time = $time;
21
            packet1.packet type = packet type'($urandom range(0, 2));
22
            packet1.packet priority = priority type'($urandom range(0, 2));
23
            packet1.data = $random;
24
25
            mb.put(packet1);
26
            #5;
27
          end
28
        endtask
29
30
        task consumer();
31
          packet t packet1;
32
          typedef packet t lp sq[$];
33
          packet t packet queue high [$];
          packet t packet queue medium [$];
35
          packet t packet queue low [$];
37
          repeat (20) begin
38
            mb.get(packet1);
39
            case (packet1.packet priority)
40
              HIGH: packet queue high.push back(packet1);
41
              MEDIUM: packet queue medium.push back(packet1);
42
              LOW: packet queue low.push back(packet1);
43
            endcase
44
          end
45
46
          while (packet queue high.size()) begin
47
            packet1 = packet queue high.pop front();
48
            $display("Received Packet - ID: %0d, Sent Time: %0t, Type: %s, Priority: %s, Data:
            %b",
49
                          packet1.ID, packet1.sent_time, packet1.packet_type.name(), packet1.
                          packet priority.name(), packet1.data);
50
            #20;
51
          end
52
53
          while (packet queue medium.size()) begin
54
            packet1 = packet queue medium.pop front();
5.5
            $display("Received Packet - ID: %0d, Sent Time: %0t, Type: %s, Priority: %s, Data:
            %b",
56
                          packet1.ID, packet1.sent time, packet1.packet type.name(), packet1.
                          packet_priority.name(), packet1.data);
57
            #20;
58
          end
59
          while (packet_queue_low.size()) begin
61
            packet1 = packet_queue_low.pop_front();
62
            $display("Received Packet - ID: %0d, Sent Time: %0t, Type: %s, Priority: %s, Data:
            %b",
63
                          packet1.ID, packet1.sent time, packet1.packet type.name(), packet1.
                          packet priority.name(), packet1.data);
```

The code

```
64
           #20;
65
         end
66
       endtask
67
68
       initial begin
69
         fork
           producer();
71
           consumer();
72
         join
73
         $display("Finished!");
74
       end
75
     endmodule
76
```

The Simulation Results:

```
Contains Synopsys proprietary information.
Compiler version S-2021.09; Runtime version S-2021.09; Feb 27 06:05 2024
Received Packet - ID: 148, Sent Time: 5, Type: MESSAGE, Priority: HIGH, Data: 110000001001001011111010000001
Received Packet - ID: 170, Sent Time: 10, Type: MESSAGE, Priority: HIGH, Data: 10000100100100101101011000001001
Received Packet - ID: 12, Sent Time: 20, Type: COMMAND, Priority: HIGH, Data: 0000011010111101101010111101
Received Packet - ID: 113, Sent Time: 30, Type: MESSAGE, Priority: HIGH, Data: 1011001011000010100001001100101
Received Packet - ID: 152, Sent Time: 45, Type: COMMAND, Priority: HIGH, Data: 00000110110101111100110100001101
Received Packet - ID: 38, Sent Time: 95, Type: MESSAGE, Priority: HIGH, Data: 10111011111010010011110111
Received Packet - ID: 90, Sent Time: 0, Type: COMMAND, Priority: MEDIUM, Data: 0001001001010101010100100100
Received Packet - ID: 167, Sent Time: 15, Type: MESSAGE, Priority: MEDIUM, Data: 1011000111110000010110011001100111
Received Packet - ID: 187, Sent Time: 25, Type: COMMAND, Priority: MEDIUM, Data: 0100011011011111100110011001101
Received Packet - ID: 37, Sent Time: 40, Type: COMMAND, Priority: MEDIUM, Data: 00000000111100111110001100000001
Received Packet - ID: 93, Sent Time: 50, Type: MESSAGE, Priority: MEDIUM, Data: 001110110010001111111000101110110
Received Packet - ID: 13, Sent Time: 65, Type: MESSAGE, Priority: MEDIUM, Data: 01000110001011011111011110001100
Received Packet - ID: 70, Sent Time: 70, Type: COMMAND, Priority: MEDIUM, Data: 01111100111111011111001111111001
Received Packet - ID: 9, Sent Time: 85, Type: CONTROL, Priority: MEDIUM, Data: 1101010100010111101001010101010
Received Packet - ID: 106, Sent Time: 35, Type: CONTROL, Priority: LOW, Data: 100010010011011010100100010010
Received Packet - ID: 28, Sent Time: 55, Type: COMMAND, Priority: LOW, Data: 000111101000110110011010111101
Received Packet - ID: 39, Sent Time: 60, Type: MESSAGE, Priority: LOW, Data: 011101101101010001010111111101101
Received Packet - ID: 95, Sent Time: 75, Type: COMMAND, Priority: LOW, Data: 1110001100110111001001001100110
Received Packet - ID: 118, Sent Time: 80, Type: CONTROL, Priority: LOW, Data: 11100010111101111000010011000101
Received Packet - ID: 121, Sent Time: 90, Type: CONTROL, Priority: LOW, Data: 0111001010101111111110111111100101
Finished!
```