20005010 3

DLDCA Lab 7
Report

Entity:

```
entity Traffic_Lights_Controller is
    port ( clk, rst, tr1, tr4 : in std_logic ;
    r, g, y : out std_logic_vector (4 downto 0));
end entity ;
```

Approach :

Whenever clk is changed (rising_edge), check if reset == 1. if reset is not, one then check the value of the variable / signal called 'state'. and Based on the value of state, the 'time_on' variable is increased if the light has more time to be on. once time_on variable reaches the corresponding action's time-period the state remains the same. Then the state is changed to trigger the next action.

State

0	L0 green	(rest are red is implied)
1	L0 yellow	
2	L1 green	
3	L1 yellow	
4	L2 green	
5	L2 yellow	
6	L3 green	
7	L3 yellow	
8	L4 green	
9	L4 yellow	

L1 green ↓ L4 green ↓

when state is 1 or 3, tr1 or tr4 are checked respectively to be true, if yes then the state is retained, else the state is changed to 4 or 0 respectively.

↓ L2 green ↓ L0 green

Explaining output.txt:

The output from the Controller is written onto the output.txt file in intervals of 1 second.

So you can see the sequence below
[testbench, input such that tr1, tr4 = 1, 1 then tr1, tr4 = 0, 0]

Side note: (output of each line is in format

$r_0\ r_1\ r_2\ r_3\ r_4\ g_0\ g_1\ g_2\ g_3\ g_4\ y_0\ y_1\ y_2\ y_3\ y_4$

Color, lane no.)

Line no.			
1-60	first 60 lines is	L2 green	(11011001000000)
61-65	next 5 lines/seconds	L2 yellow	
66-125	60 lines / seconds	L3 green	
126-130	5 seconds	L3 yellow	
131-160	30 seconds	L4 green	(cause tr4 = 1)
161-165	5 seconds	L4 yellow	
166-225	60 seconds	L0 green	
226-230	5 seconds	L0 yellow	
231-260	30 seconds	L1 green	(cause tr1 = 1)
261-265	5 seconds	L1 green	

Next light cycle with tr1, tr4 = 0, 0

266-325	60 seconds	L2 green	
326-330	5 seconds	L2 yellow	
331-390	60 seconds	L3 green	
391-395	5 seconds	L3 yellow	
396-455	60 seconds	L0 green	(L4 skipped cause tr4=0)
456-460	5 seconds	L0 yellow	
461-520	60 seconds	L2 green	(L1 skipped cause tr1=0)
521-525	5 seconds	L2 yellow	
526-550	25 seconds	L3 green	

↓ limit of my test bench, where I told to complete sim

Waveform description (pics):

time	
248	WAY 1 : tr1, tr4 = 1, 1, L1 green
263	WAY 2 : L1 yellow is on
288	WAY 3 : tr1, tr4 = 0, 0, L2 green
329	WAY 4 : L2 yellow
380	WAY 5 : L3 green