DIT635 - Finite State Verification Activity

Temporal Operators: A quick reference list.
- G p: p holds globally at every state on the path
- F p: p holds at some state on the path
- X p: p holds at the next (second) state on the path
- p U q: q holds at some state on the path and p holds at every state before the first state at which q holds.
- A: for all paths from a state, used in CTL as a modifier for the above properties (AG p)
- E: for some path from a state, used in CTL as a modifier for the above properties (EF p)

Consider a finite state model of a traffic-light controller similar to the one discussed in the homework, with a pedestrian crossing and a button to request right-of-way to cross the road.

State variables:
- **traffic_light: {RED, YELLOW, GREEN}**
- **pedestrian_light: {WAIT, WALK, FLASH}**
- **button: {RESET, SET}**

Initially: **traffic_light = RED, pedestrian_light = WAIT, button = RESET**

Transitions:
pedestrian_light:
- **WAIT → WALK if traffic_light = RED**
- **WAIT → WAIT otherwise**
- **WALK → {WALK, FLASH}**
- **FLASH → {FLASH, WAIT}**

traffic_light:
- **RED → GREEN if button = RESET**
- **RED → RED otherwise**
- **GREEN → {GREEN, YELLOW} if button = SET**
- **GREEN → GREEN otherwise**
- **YELLOW→ {YELLOW, RED}**

button:
- **SET → RESET if pedestrian_light = WALK**
- **SET → SET otherwise**
- **RESET → {RESET, SET} if traffic_light = GREEN**
- **RESET → RESET otherwise**

1. Briefly describe a safety-property (nothing "bad" ever happens) for this model and formulate it in CTL.

2. Briefly describe a liveness-property (something "good" eventually happens) for this model and formulate it in LTL.