EXPERIMENT 5 DIGITAL CIRCUITS 2022

Problem Statement

This lab is about solving the given problem statements on the Circuit verse.

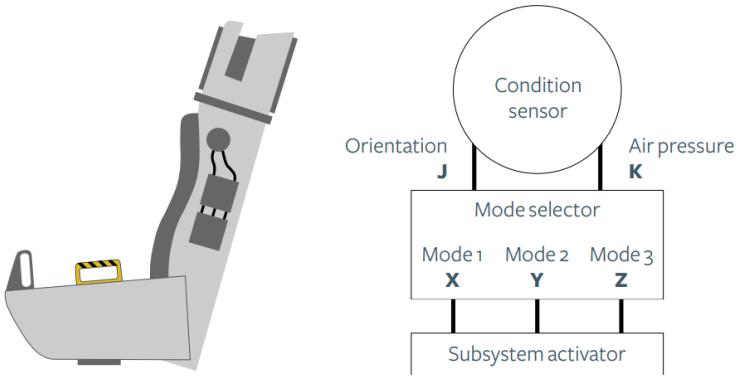
1) Ejector seats are designed to rescue the crew of an aircraft during an emergency. To reduce the risk of injury to the occupants during ejection, several ejection modes are available depending on the environmental conditions. For example, one ejector seat selects from three modes based on the orientation of the aircraft and the air pressure:

• Mode 1 – Used while the aircraft is upright and air pressure is high

• Mode 2 – Used while the aircraft is upright and air pressure is low

• Mode 3 – Used while the aircraft is upside-down regardless of air pressure

A condition sensor measures the orientation and air pressure and sends this information to a mode selector. The mode selector then selects the appropriate mode and activates subsystems, such as rockets and parachutes, for that mode.



Hint:

Design the logic circuit required to select the mode, modeling the orientation, air pressure and mode selector as follows:

- Orientation (Input J)

  0 – Aircraft upright

  1 – Aircraft upside down

- Air Pressure (Input K)

  0 – High pressure

  1 – Low pressure

- MODES (output X,Y, Z)

  X at logic 1 – Mode 1

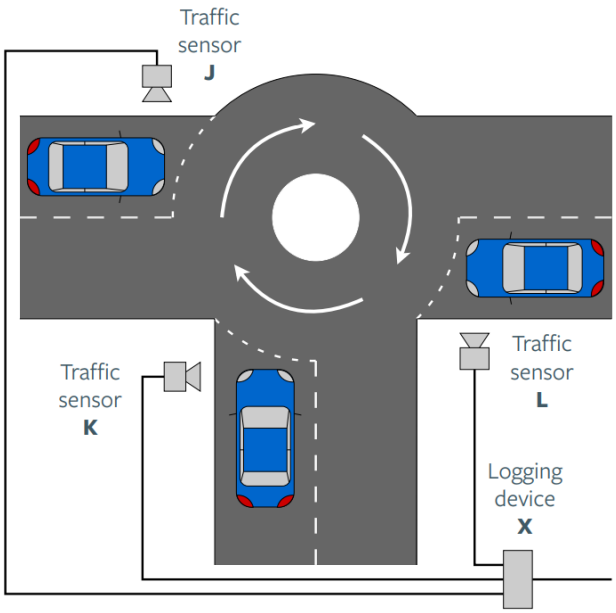
  Y at logic 1 – Mode 2

  Z at logic 1 – Mode 3

  (Other outputs in each mode are logic 0)

2) A local council has received numerous reports of congestion occurring at a roundabout. In order to confirm these reports and determine the severity of the issue, a monitoring system has been proposed to analyze traffic coming from the three entrances to the roundabout.

   At each entrance, a sensor has been set up to detect whether traffic is waiting at that entrance. A logging device is then activated when at least two of these sensors have been triggered, allowing the council to evaluate how often and how long traffic is waiting, and whether any improvements to the roads are required.



Hint:

Design the logic circuit required for this congestion detection system, modeling the sensors and logging device as follows:

- Sensors (Input J, K, L)

  0 – Entrance Clear (No traffic congestion)

  1 – Traffic Congestion

- Logic Device (output X)

  0 – No congestion (Inactive)

  1 – Congestion Detected (Logging)

Deliverables & Rubrics (Total-10 marks, 5 marks for each part)

Aim and Components/ICs are ungraded but should be mentioned in the lab file.
Write the 1-6 points for both the parts and submit it as single pdf.
Keep the circuit on private mode. Add the following members(email_id)as a collaborator for your circuit design:- Your evaluator (mentioned on the sheet) and the 2 lab TAs and with the TFs.
TFs- (sana@iiitd.ac.in, khagendra@iiitd.ac.in) .

1) Aim
2) Components used
3) Link to circuitverse workspace. (2 marks)
4) Neat Circuit Diagram (Screenshot of Circuit workspace): (0.5 marks)
5) Truth Table and boolean expressions: (2 marks)
6) Observation and Results: (0.5 marks)