Testing and Refinement

❖ Test case based on input combination.

➢ In order to test our system to be implemented various test need to be done to check for any error malfunction to avoid expenditure of valuable resources, so to test the operation of the system we create different scenarios for the system with three different inputs that are: Train approaching, Train cleared and finally vehicle on track to test how the system will respond.

S.No	INPUTS			OUTPUTS		
	Train Approaching	Train Cleared	Vehicle on Track	Gate Status	Signal for vehicle	Signal for train
1.	No	No	No	Raised	Green	Yellow
2.	No	No	Yes	Raised	Green	Yellow
3.	No	Yes	No	Raised	Green	Yellow
4.	No	Yes	Yes	Raised	Green	Yellow
5.	Yes	No	No	Lowered	Red	Green
6.	Yes	No	Yes	Lowered	Red	Red
7.	Yes	Yes	No	Lowered	Red	Green
8.	Yes	Yes	Yes	Lowered	Red	Red

❖ Result from the input combination test.

➢ After testing whether the input and output of the works before implementing the system to real world structures they need to be test even more meticulously which is why possible scenario is created for the system to respond to and based on the feedback it can be implemented on real world rail-way gate system.

S.No.	Train Approaching	Train Cleared	Vehicle on Track	Gate Status (Expected)	Signal for Vehicles (Expected)	Signal for Trains (Expected)	Gate Status (Actual)	Signal for Vehicles (Actual)	Signal for Trains (Actual)
1	No	No	No	Raised	Green	Yellow	Raised	Green	Yellow
2	No	No	Yes	Raised	Green	Yellow	Lowered	Red	Yellow
3	No	Yes	No	Raised	Green	Yellow	Raised	Green	Yellow
4	No	Yes	Yes	Raised	Green	Yellow	Lowered	Red	Yellow
5	Yes	No	No	Lowered	Red	Green	Lowered	Red	Green
6	Yes	No	Yes	Lowered	Red	Red	Lowered	Red	Red
7	Yes	Yes	No	Lowered	Red	Green	Lowered	Red	Green
8	Yes	Yes	Yes	Lowered	Red	Red	Lowered	Red	Red

❖ Improvements and refinements for the logic circuit

➢ Despite the results, many more improvements could be made to make the system safer and even more effective:
- Continuously test sensors, gates, and signals; default to closed gates if faults are detected.

- Ensure backup power closes gates during outages and maintain redundant communication.
- Provide manual override for operators while logging into interventions.
- If an obstruction is detected on the track, keep gates lowered, trigger alarms, and alert the operator.