**DRIVERLESS CAR CHALLENGE**

**The capabilities to be demonstrated are organised into four Levels, with each Level progressively requiring more complex vehicle behaviour.**

* **TEST LEVELS**

1. Within each Level, each “test” is classified as either “Mandatory” or “Optional”.
2. The vehicle has to perform successfully in all the Mandatory Tests in that Level to

qualify for the next Level/Stage.

1. In addition, the vehicle has to clear 60% of the Optional Tests to qualify for the next Level.

**All tasks in Level 0 and 1 are mandatory**

* **Level 0**
* The speed limit for the VUT (Vehicle Under Test) for the tests in Level 0 is 20 kmph.
  + - * **Loading the Trip Plan File**

TPF provides a series of path points defined by their latitude and longitude.

Performance will be considered successful if the VEHICLE starts moving towards the first path point, no later than 5 minutes from the time of TPF upload.

* + - * **Real Time Data Logger**

The Data Logger must record the following:

a) Vehicle data for the last 6 hours of driving. It must be possible to download this data from an SD card or USB port on the Data Logger post a test.

b) Front and rear camera video, LIDAR and other sensor streams for at least 3 hours.

* + - * **Range and Time to Emergency Stop**

VEHICLE will be given a command to “Stop” and “Start” from a distance of 500 m, anytime during the course of run. The performance will be considered successful if the VEHICLE responds to the Start and Stop signals within 1 second of the command.

* + **Moving through the Path Points to the End Location**

The VUT has to move to the last path point through all the path points indicated in the TPF. Covering all path points along the way will qualify as success.

* + **Stopping on reaching the End Location**

Stopping at the end location marked “Stop” within 1 metre will be deemed a success. Post stopping, the VUT must securely park itself including application of parking brakes.

* + **Lane Detection**

Teams will be provided with a stretch of 500 m with proper lane markings. The VUT will have to remain within the lane at all times in that stretch. Wheels over the lane markings or straddling lanes will be declared unsuccessful.

* + **Detection of basic traffic signs**

Red light

Green light

Turning at Left and Right Signals

* + **Speed Tests**

Straight stretches without obstacles

Around corners

Negotiating speed bumps

* + **Identification of Static Obstacle**
  + **Simple Collision Avoidance**

The VUT should avoid any collision whatsoever at all times, whether with a stationary or a moving obstacle.

**At this level, oncoming traffic will not be present**

* **Level 1**
* Multiple VUTs will be tested simultaneously in this Level.
  + **Adhering to the Maximum and Minimum Speed Limit.**
  + **Excess delay on route**

VUTs should not exhibit excessive “stop and stare” delays beyond 30 seconds.

* + Stopping at intersection and detection of traffic signals.
  + **Vehicle distance**

At all times, VUTs are required to maintain a minimum forward vehicle distance of 1 vehicle length for every 15 kmph of speed.

* + **Overtaking and U turn manoeuvre**
  + **Precedence at Roundabouts**
  + **Driving on an inclined plane ( upward and downward slope)**
  + **Identification of Moving Obstacle**
  + Test the ability of the car to move forward in a stop-and-go traffic environment at not more than 10 kmph.
* **Level 2**
* **Unstructured Obstacle Avoidance**
* **Parking- Parallel, Angle, Perpendicular,** On Incline(optional)
* **Route Re-planning(Optional)**
* Merging into traffic – Parallel, U turn, Right turn at Intersection
* **Collision avoidance**

Stationary, Crossing Object

Items falling off a vehicle

* **Level 3(Indian Conditions)**
* All tests in this level are optional.
* **Trailing or avoiding a truck with protruding rods**
* **Identifying and slowing down to a shallow ditch or unmarked bumps**
* **Navigating through a Multi-modal situation**
* **Behaviour upon blowing horns from behind**
* **Wading through water logged streets**
* **Night driving capabilities**

Parking

Obstacle avoidance

Reading road signs