|  |  |
| --- | --- |
| Course name | Numerical Modeling & Simulation in MATLAB-Simulink |
| **Lesson name** | **Numerical Modelling of Nissan Leaf using Artemis Urban Drive Cycle data in** MATLAB-Simulink |
| **Lesson objective** | **Practice blocks &** **acquaint to use GUI of MATLAB-Simulink** |
| Created by | Bharath Kumar P |

**Problem statement:** Model Nissan Leaf for Artemis Urban Drive Cycle in MATLAB Simulink to plot the Wheel Torque, Wheel Speed, Motor Torque, Motor Speed and Battery Current in Scilab-Xcos.

**Artemis Urban Drive Cycle Graph:**

**Model Inputs:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl No** | **Parameter** | **Value** | **Units** |
|  | **Chassis** |  |  |
|  | 1. Coefficient of rolling resistance |  |  |
|  | 1. Mass of Vehicle |  | Kg |
|  | 1. Mass of Driver |  | Kg |
|  | 1. Gravity constant |  | m/s |
|  | 1. Grade Angle |  | degree |
|  | 1. Velocity |  | Kmph |
|  | 1. Area |  | m^2 |
|  | 1. Air Density |  | Kg/m^3 |
|  | 1. Drag Coefficient |  |  |
|  | 1. Radius of wheel |  | m |
|  | **Transmission** |  |  |
|  | 1. Gear Ratio |  |  |
|  | 1. Transmission Efficiency |  | % |
|  | **Battery** |  |  |
|  | 1. Battery Capacity |  | Wh |
|  | 1. Battery Voltage |  | V |
|  | 1. Artemis Urban drive cycle distance |  | Km |
|  | 1. Battery Initial SOC |  | % |
|  | 1. Drive Cycle time or Simulation time |  | s |
|  | **Cell** |  |  |
|  | 1. Cell Voltage |  | V |
|  | 1. Cell Capacity |  | Ah |

**Program:**

**Results:**

|  |  |
| --- | --- |
| **Rolling Force:** | **Gradeability Force:** |
|  |  |
| **Aerodynamic Force:** | **Acceleration Force:** |
|  |  |
| **Wheel Speed:** | **Wheel Torque:** |
|  |  |
| **Motor Speed:** | **Motor Torque:** |
|  |  |
| **Motor Power:** | **Battery Power:** |
|  |  |
| **Battery Current:** | **Battery SOC:** |
|  |  |
| **Battery C-rate:** |  |
|  |  |

**Conclusion:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl No** | **Parameters** | **Values** | **Units** |
|  | **Chassis** |  |  |
|  | * Rolling Force |  | N |
|  | * Gradeability Force |  | N |
|  | * Maximum Aerodynamic Force |  | N |
|  | * Maximum Acceleration Force |  | N |
|  | * Maximum Wheel Speed |  | Rpm |
|  | * Maximum Wheel Torque |  | Nm |
|  | **Motor** |  |  |
|  | * Maximum Motor Speed |  | Rpm |
|  | **Motor Torque** |  |  |
|  | * Nominal Motor Torque |  | Nm |
|  | **Motor Power** |  |  |
|  | * Nominal Motor Power |  | W |
|  | **Battery** |  |  |
|  | * Power per Km |  | Wh/Km |
|  | * Vehicle Range |  | Km |
|  | * Battery Capacity in Ah |  | Ah |
|  | **Cell** |  |  |
|  | * Cell Voltage |  | V |
|  | * Cell Capacity |  | Ah |
|  | **No of cells** |  |  |
|  | **Battery Power** |  |  |
|  | * Nominal Battery Power |  | W |
|  | **Battery Current** |  |  |
|  | * Nominal Battery Current |  | A |
|  | **Battery C-rate** |  |  |
|  | * Nominal Battery Discharge C-rate |  | C |
|  | * State of Charge |  | % |
|  | **Regenerative** |  |  |
|  | **Battery Power** |  |  |
|  | * Nominal Battery Power |  | W |
|  | **Battery Current** |  |  |
|  | * Nominal Battery Current |  | A |
|  | **Battery C-rate** |  |  |
|  | * Nominal Battery Discharge C-rate |  | C |
|  | * State of Charge |  | % |