Test Plan

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DOCUMENT HISTORY

Version	Date	Changes	Done by	Reviewed
0.1	2022-10-14	First draft	Whole group	Robin Holmbom
0.2	2022-10-17	Added tests as requested by reviewer	Karl,Calle & William	

1 INTRODUCTION

The testing will mainly be performed in a simulation environment at the beginning whereas some laboratory environment tests will be conducted later on. The simulation environment for the simulation will be Simulink where the engine model from the course TSFS09 will be reused/redesigned.

2 TESTS

This section describes the test that are to be performed and which weeks they will take place. The permissible result is stated with the responsible person for executing each test. In Table 1 an example of the structure is shown.

Table 1: Example test list

Test No	**Req. No tested**	**Weeks for test**	**Implementation**	**Permissible results**	**Responsible**
1	1	46-48	Step response	over 1	Karl

2.1 Tests of Raspberry Pi

Test No	**Req. No tested**	**Weeks for test**	**Implementation**	**Permissible results**	**Responsible**
2	-	39-40	Measure the analog output signals from the Raspberry Pi with an oscilloscope	The control signal generated by the Raspberry Pi shall be within $-0.135V$ to $0.135V$	Arvid

2.2 Tests of Control Model and Engine Simulation

Test No	Req. No tested	Weeks for test	Implementation	Permissible results	Responsible
3	6-9,12, 14,15 19	40-42	Control the throttle from the Raspberry Pi in real time with parameters changed during the run and also collect data from the throttle	The throttle should be controlled by the raspberry pi (respond as expected) and the data received from the throttle (throttle angle) should be reasonable.	Arvid & Claes
4	3,6,11	38-39	Run the vehicle simulink model for different drive cycles	The results should be reasonable i.e acceleration and speed within reasonable bounds and the model should be stable	Arvid & Claes
5	2,20,23	44-47	Test run the throttle with an adaptive regulator active while the throttle angle moves in and out of the limp home region	The regulator should be able to handle the transition between the piecewise regions (i.e. in and outside the limp home region)	Calle & Gustav
6	18,21,22	46-49	Test run the throttle with the regulator active with different model parameters	The data shall be used for analysis	Claes & Karlo

2.3 Tests of Throttle Characteristics

Test No	Req. No tested	Weeks for test	Implementation	Permissible results	Responsible
7	4,10,11 16,17,31	41	Basic tests of throttle characteristics such as hysteresis in cold, normal and warm environments performed on an old and new throttle	Basic grasp and plots of some characteristics	Calle & Karl
8	32	39-44	The control signal generated to measure the throttle characteristics shall be measured with an oscilloscope before being applied to the throttle	The control signal generated shall be within $-0.135V$ to $0.135V$	Calle & Karl
9	5,17,24	39-44	Test the software on a real engine	Controlling of torque and engine speed possible	Calle & Karl

2.4 Tests on Final Product

Test No	Req. No tested	Weeks for test	Implementation	Permissible results	Responsible
10	25 - 29, 31 - 33	41-49	A step response test on the throttle control	Static error on step response will be max 0.125%. The settling time (+- 5%) will be less than 200ms for step greater than 50%. The settling time (+- 5%) will be less than 100ms for step smaller than or equal to 50%. The overshoot will be less than 0.5% pos for step greater than 50%, otherwise less than 0.015 % pos. When tracking a continuous reference the error should never be greater than 2.5 % pos with a reasonable ramp of in signal (for example during drive cycle)	Calle & Karl
11	1	49	Compare hysteresis constructed through ML with documented measured ("real") hysteresis of the throttle	These hysteresis should be as similar as possible, although some deviation is to be expected when the ML has limited estimation data.	Claes & Karl