**Automatic Control ECE (05LSLLP)**

# *am Simulation*

Surname Name ID

**Design Report**

**Develop the design procedure through**

* **a MATLAB script, named s123456\_design.m. The relevant transfer functions and variables must be named as follow:**
  + Plant transfer function **G**
  + Steady state controller transfer function **C\_SS**
  + Controller transfer function **C**
  + Constant magnitude locus **T\_p** (in dB)
  + Constant magnitude locus **S\_p** (in dB)
  + Desired cross-over frequency **wc\_des**
  + Constant magnitude locus **M\_T\_HF** (in dB)
  + Constant magnitude locus **M\_S\_LF** (in dB)
* **a Simulink file, named s123456\_sim.slx.**

**Save all the design results in the s123456.mat, by using the statement**

**>> save s123456**

In all the above files, replace s123456 with your own ID.

This part is of the exam is evaluated only if the required 4 files (s123456\_design.m, s123456\_sim.slx, s123456.mat, s123456\_Design\_Report\_ECE.docx) are correctly delivered.   
If the designed controller does not stabilize the feedback control system, the score of this part is 0 points.

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***Steady state requirements analysis and design (3 points; quit the evaluation in the presence of either a “destabilizing” steady state controller or wrong type of the control system)***

System type = 1

Css(s) = 17.78

***Sinusoidal disturbance requirements analysis (0.5 points)***

MTHF = -34.8945 *c,des* = 35

***Transient and requirements analysis (0.5 points)***

** = 0.52 *Tp* = 1.0616 *Sp* = 3.1672 *c,des* = 26.12

***Design procedure description (3 points)***

Describe here the main steps of your design procedure (no MATLAB code!)

After steady state design, I checked my loop transfer function on Nichols diagram, phase lead is needed, so I chose to use a negative real zero, after that magnitude increase is needed , so I chose to change the value of kc, finally I add a clourse pole to make the control proper. Then I run the simulation ,check all the requirements are match.

***Design results and performance evaluation (10 points)***

C(s) = kc\*(1+s/wz)/(s\*(1+s/wp)) , kc = 17.78, wz =30,wp =300 in dc-gain form (-1 wrong form; quit if absent)

(e.g., , this is only an example!)

Performance are evaluated according to the following criteria.

* 2 points for each satisfied requirement (with tolerance 5%);
* 1 point for each unsatisfied requirement with error between 5% and 15%;
* 0 points for each unsatisfied requirement with error between 15% and 20%;
* - 1 point for each unsatisfied requirement with error between 20% and 25%;
* - 2 points for each unsatisfied requirement with error > 25%.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Requirement | 1 | 2 | 3 | 4 |
| Value | 0 | 0.001 | 14% | 0.232 |

*Cut and paste in the space below the plot of all the relevant variables needed to provide evidence of the achieved performance.*