Name:

Roll No: e.g. 170001

Dept.: e.g. CSE

Indian Institute of Technology Kanpur
CS637 Embedded and Cyber-Physical Systems
Homework Assignment 1
Deadline: September 27, 2020

Instructions:

Total: **40 marks**

1. This question paper contains a total of 9 pages (9 sides of paper). Please verify.
2. Write your name, roll number, department, section on **every side of every sheet** of this booklet
3. Write final answers **neatly** in the given boxes.

Problem 1. (20 points) Problem 7 in the Exercises of Chapter 2 in [LS15].

[LS15] Edward A. Lee and Sanjit A. Seshia, Introduction to Embedded Systems, A Cyber-Physical Systems Approach, Second Edition, http://LeeSeshia.org, ISBN 978-1-312-42740-2, 2015.

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Problem 2. (20 points) The states of the linearized model of the vehicle steering system represent the lateral deviation of the vehicle from the x-axis and the angle between the vehicle axis and the x-axis. The output of the linearized model is only the first state. Construct a Simulink model for the vehicle steering system with its controller that includes an observer. The dynamics are available in Example 6.4 and Example 7.3 in [AM09]. Apply a sinusoidal signal as the reference trajectory that specifies the desired deviation of the vehicle from the x-axis with time. Plot the output (lateral deviation of the vehicle from the x-axis) with time.

[AM09] K. J. Astrom and R. M. Murray. Feedback Systems: An Introduction for Scientists and Engineers. Princeton University Press, 2009.
http://www.cds.caltech.edu/∼murray/books/AM05/pdf/am08-complete_22Feb09.pdf.

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BLANK SPACE: Any answers written here will be left ungraded.
No exceptions.
You may use this space for rough work.