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ELG4157    Modern Control Engineering: Midterm 1    February 25, 2020

Name:

Number:

**Question 1 (5 marks)**

You are given an inductor  $L = ?$ , a capacitor  $C = ?$ , and a resistance  $R = ?$ , a diode switch with PWM duty cycle of ? % to design and implement a Buck DC (? V) to DC (? V) converter.

- Draw the circuit diagram of the buck converter with idealized waveform and the related equivalent circuits.
- Write the differential equations of the Buck converter.
- Model the Buck converter in the state variable form by averaging.
- Design the state feedback gains to obtain OS of ? % and settling time of 1 second.

**Question 2 (5 marks)**

Consider a plant with  $G(s)$ . Keep settling time to a step input is ? seconds

- By **Design**, turn the system into a robust system.
- Physically **realize** the controller and the filter