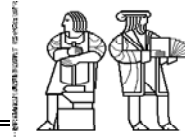


MASSACHUSETTS INSTITUTE OF TECHNOLOGY



DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

6.622 Power Electronics Assessment #9

Due: Thursday May 4, 2023 at 11:00 pm (Cambridge time)

YOUR NAME

YOUR KERBEROS ID

General Instructions:

1. You must complete this assessment on your own with no consultation or discussion with any other person, excepting 6.622 staff, of whom you may ask clarifying questions. Do not discuss your solutions with anyone until the solutions have been released.
2. You may use a calculator and review the course lectures, handouts, notes, textbook (Principles of Power Electronics) and other materials provided for the course on Canvas when completing this assessment. Please do not use other computational tools or reference materials.
3. Please do all of your work in the space provided. In particular, try to do your work for each question within the boundaries of the question, or on the additional pages at the end of the uploaded document, clearly marking those pages to indicate what problem they relate to. Place the answer to each question within the appropriate answer box.
4. The assessment must be completed and uploaded by the indicated date/time to receive credit.
5. Please make sure to show all of your work. This is important both for you to receive credit for a correct answer and to receive partial credit when an answer is wrong or incomplete.

Problem 1

This problem deals with a buck/boost converter in discontinuous conduction (DCM), following on KPVS examples 12.5 and 12.8.

Suppose we consider the case for a buck-boost converter operating in DCM in which the duty ratio is fixed at a constant value D , but the input voltage has small-signal perturbations, that is: $v_{IN} = V_{IN} + \tilde{v}_{in}$. Find a small-signal circuit model akin to that of KPVS Fig. 12.10 for this case.



(Additional Work)

MIT OpenCourseWare
<https://ocw.mit.edu>

6.622 Power Electronics
Spring 2023

For information about citing these materials or our Terms of Use, visit: <https://ocw.mit.edu/terms>