Examination Feedback for EEE307 – Power Electronics
Spring Semester 2015-16

Feedback for EEE307 Session: 2015-2016

Feedback: Please write simple statements about how well students addressed the exam paper in general and each individual question in particular including common problems/mistakes and areas of concern in the boxes provided below. Increase row height if necessary.

General Comments:

100% exam module. Despite generous marking with points awarded for method, the overall average for this exam was lower than usual, which may be attributed to it being one of the last exams in the period. This was supported by the number of email questions concerning tutorial sheets just days before the exam. The distribution of marks shows a trend that either students did particularly well with a high average across the questions, or quite poorly on all questions.

Question 1:

Attempted by approximately 32% of candidates. Part (a) was well attempted in general, however many students did not appreciate that a flyback converter was constructed by including an isolation transformer in a buck-boost converter (Part (b)). Diagrams were often seriously flawed, yet the transfer function was quite often provided correctly, no doubt from memory as opposed to derived. Some students did not include the transformer turns ratio in the transfer function which led to very small duty-cycles for Part (c) and therefore incorrect answers for L and C. Method points were awarded for correct treatment of problem if the transfer function was incorrectly given. Many mistakes were made in not allowing for the rectified mains providing a 325V dc input to the flyback converter. Part (d) required appreciation of audible buzz and larger reactive components, yet many students discussed turn-off times and that the components selected for 125kHz would not work at 18kHz, despite the question stating it would be redesigned for 18kHz operation.

Question 2:

Attempted by approximately 96% of candidates. A variant of one of the tutorial sheet questions, in general this question was answered well, however some students did not show appreciation of whether the load was resistive or inductive for each part of the question. Part (a) was quite often not derived, but final equations recorded. Part (b) seemed to cause students a lot of problems when calculating the power dissipated in the load due to a non 50% duty across a resistive load (similarly in Part (d – i)). Students used average voltage and not rms voltage to calculate power. Part (c) was often calculated with diodes conducting which is impossible for an ideally switched resistive load, and Part (d) often did not include diode losses for an inductive load. Time and again students could be seen entering the incorrect values of current and voltage – using the maximum ratings and not the operating current and voltage.

Question 3:

Attempted by approximately 79% of candidates. Part (a) was answered in a wide range of levels – some students mentioning the use of diodes and/or thryistors, some giving the DC output voltage equations, whilst others gave graphs, equations, circuit diagrams etc. Marks were graduated on quality of description. Part (b) required diagrams of operation which were often very poor, and quite often the equations for a semi-converter were given. Quite often the circuit diagram would be drawn incorrectly with each thyristor having a diode in parallel with it. For Part (c) the equations for a buck converter were quite often seen despite being a full converter, but in the main this part was well answered. Some confusion as to the conditions for continuous current because of load angle was also evident.

Question 4:

Attempted by approximately 92% of candidates. Part (a) was generally answered well; however the derivations often showed that the student was not perturbing the system at all, or in general perturbing the input voltage and not the duty cycle (i.e. audio susceptibility). Derivations were often incomplete and some students did not know how to transform the equations into the Laplace domain and simply multiplied every term by 's'. Part (b) showed that some students do not read the question and repeat previous exam answers verbatim – using BJTs instead of the diodes asked for. Part (c) was usually correctly addressed in terms of method, but incorrect values were used in the equations. Students seemed to appreciate that 10% voltage variation across a diode was 50V, but not that the net dV would be 100V for both (10% of the maximum 1000V across both). However when power ratings were asked for, most students stated that the maximum voltage seen by a diode would be 550V, implying 450V on the other diode and therefore 100V difference.