Examination Feedback for EEE123 – Introduction to Electric and Electronic Circuits
Spring Semester 2013-14

Feedback for EEE123 Session: 2013-2014

General Comments:

The exam counts for 80% of the overall module marks, with 4 lab classes making up the remaining 20%.

About 5% of candidates only answered 3 questions (did they assume the old 2 hour exam format?) and a handful answered more than the required 4 (additional questions were not marked) – ***you should always read the rubric on the front cover of the exam to find out the number of questions that you need to answer.*** About 60% of candidates failed to fill in the numbers of the questions answered on the front cover of the answerbook – this puts the marker in a bad mood and they are less likely to be lenient! Some scripts were extremely untidy and difficult to read and more detailed explanations need to be given.

Question 1:

Attempted by about 90% of candidates. This was similar to circuits encountered on previous exam papers, although the presence of the 5Ω caused major problems for most candidates. In part (a)(i) the point A is not connected to anything so this resistor plays no part in calculating the current in the remainder of the network; however it does need to be considered when calculating the Thevenin resistance in part (a)(ii). Most candidates attempted this question using superposition, despite the question requesting the use of Kirchoff's laws. Another source of error was failure to draw a diagram or mark on the direction of the currents. Some candidates also tried to use loop currents (which are not taught on this course) and usually got mixed up with signs. Most candidates made a reasonable attempt at parts (b)(i) and (ii) but many omitted to calculate the rms current, got confused between kW, kVA and KVAr, or forgot the 1000 (kilo) factor. In part (c)(i) many candidates simply added together the kVA values which is incorrect; you need to sum the real powers (kW) and the reactive powers (kVAr) and the sum as vectors. Candidates who attempted parts (c)(iii) and (iv) usually made a good attempt.

Question 2:

Attempted by about 90% of candidates. Part (a) was bookwork and was very poorly attempted. Invariably candidates who did not bother to draw a diagram did not perform as well as those who did. Again there was confusion over how to use $P = V^2 / R$. The question clearly requests the power dissipated in the load (not the total power dissipated). To use the above formula you need to know the voltage across the load (which is not V_s), so it is easier to find an expression for the current then use $P = I^2R$. Only a handful of candidates managed part (a)(ii) correctly; you need to use $dP/dR_L = 0$. Most candidates made a reasonable success of part (b) although again there were problems in using $P = V^2 / R$ to calculate the power in R_3 – to use this formula you need to know the actual voltage across R_3, which you don't. Part (c) caused more problems; the addition of the 10Ω internal resistance in series with the load means the overall current will change and needs to be recalculated. Part (c)(iv) presented the most problems and many candidates simply skipped this. Since this is a DC system then $dI / dt = 0$ and there is no voltage across the inductor and it acts as a short circuit. If there is no voltage across the inductor then the voltage across R_3 and R_4 is also zero hence no current flows down that branch and the power dissipated in R_3 is zero. However a current still flows through the inductor which is determined by V_s and R_{int} (6A) and hence there is energy stored in the inductor.

Question 3:

Attempted by all but 2 candidates. With hindsight this was a rather easy question and most candidates scored high marks. In part (a) the question clearly states "derive an expression" whereas most candidates simply quoted the expression with no attempt at deriving it. Part (b)(i) caused very few problems, but in part (b)(ii) many candidates incorrectly calculated the power usually because they used the $P = V^2 / R$ equation incorrectly (see also Q2 above). To use this equation you would need the voltage across the resistor only (not the R and C combination) which you do not have, therefore use $P = I^2R$. These mistakes invariably led to errors in calculating the VA in part (b)(iii). Parts (b)(iv) and (v) did not present many problems but remember that the number of turns should be a whole number. Most candidates did all of part (c) correctly, but errors included not knowing the formula for calculating the area of a circle, confusing radius and diameter, or using the primary rather than the secondary voltage.

Question 4:

There were some excellent attempts at this question but many of you made incomplete attempts as a last question, quite a few attempting only part (a). In part (a) most of you managed correctly to sketch V_O and label the diagram as requested. Fewer attempted to draw the current I_D or calculate its peak value but those who did mostly made a good job of the task. Only a few managed to suggest the correct value for V_{B2} to achieve the bottom clipping level specified. In part (b) most people correctly identified the type of rectifier circuit. There were some excellent sketches of V_O that revealed a good understanding of circuit operation . . . but there were also some featureless pencil lines that might have been a curve or might have been the result of a nervous twitch. You should always draw sketches with care and confidence; if you decide that it's wrong, cross it out and re-do it. Some people tried to use exponential decay functions to work out a suitable value for C in part (iii) but almost all of those people made mistakes in their handling of the exponential. If that was the most convenient method of calculating C I would have taught it to you – it is in fact riddled with problems. Most people realised that the design had to be based on the lowest frequency.

Question 5:

Part (a) asked or transconductance characteristics. Many people ignored the question and drew circuit symbols for the three devices mentioned and names their terminals – this was an answer to a previous years question but was irrelevant here. Most people managed the switch of part (b) although one or two people did not understand which piece of information was relevant to which bit of the calculation. The description of part (c) was well done.

Question 6:

This was attempted by almost half of you but it was attempted by many as an end of exam get a few extra marks opportunity and the majority of attempts were incomplete. There were, however, some excellent attempts at the question. Part (a) asked you to identify terms relevant to a general purpose op-amp. One person identified all 5 correct terms. Most people identified just one or two. In part (b) (i) most people identified the amplifier type. In (ii) many of you had a negative resistor ratio; this can't be right because it means that one of the resistors would have to be negative. Try going to Maplin and asking for a negative resistor! Quite a few people ignored the phase question. In part (iii) several people deconstructed the relationship given to make it look like a derivation. I was looking for key starting points – eg, summing currents at the inverting input node – followed by a logical development. In part (c) the main problem was that people couldn't handle the ac + dc format of the signals. If equating v^+ and v^-, the dc terms of v^+ must equal the dc terms of v^- and the ac terms of v^+ must equal the ac terms of v^-. A secondary problem suffered by superposition users was wrongly identifying the amplifier type – V_{dc} is operated on by an inverting gain whereas v^+ is operated on by a non-inverting gain.