Exam Feedback: EEE204 January 2012

General Comments: I was a bit disappointed by your attempt at EEE204 this year. Although the paper followed the same style and content as last year, people seemed unusually challenged by being presented with familiar ideas disguised by a slight variation in context. As last year, and, sadly, every year, many marks were lost because of silly numerical and algebraic errors and whilst each error only loses one mark, some of you were totting up quite a few that you could ill afford. I estimate that on average 5 or 6 marks per script were thrown away by carelessness. There was an unusually high incidence of calculator error and some quite alarming algebra. The two problems of poor organisation and lack of explanation reared their ugly heads in a big way this year. These are perennial problems so the comments that follow were also in last year's feedback comments. Some of you presented very messy work that was hard (in some cases impossible) to interpret and in a few cases you confused yourselves by failing to take an ordered approach to your questions. **If you are doing an analysis, you need to draw a circuit diagram** – how else can I credit correct formulation of equations describing the circuit? You need to explain briefly (three or four words is usually enough) what you are doing so that I can follow your thinking – if I just see a set of numbers or equations you leave me in a position of having to guess whether or not you are intentionally doing the right thing.

Q1: In part a(i) most of you got the right answer. The ones that didn't, failed to check their answer by letting f go to zero and infinity and working out mod gain at each extreme. And I remember pointing out that this was an easy check to do! Most of you (in part (ii)) managed to derive the transfer function of figure 1. Those who couldn't either had the gain expression upside down (another thing I warned you about) or got Z_1 and Z_2 mixed up. In part (a)(iii) I got a range of sketch shapes. If the shape was consistent with the answer to (a)(i), I gave the marks. Some people drew a frequency response . . . and got no marks - read the question. In part (iv) the majority knew what to do. Some took the view that to find the modulus you ignore j and add everything else together - wrong! Most of you managed part (v) although some didn't mention phase. A handful of people managed part (vi) - the majority of you seem intent on making GBP ideas very much more complicated than they actually are.

Q2. There was a wide range of answers to part (i). Most people correctly said it was due to capacitance and inductance that in an ideal device would be zero. Few mention ringing or damped oscillatory response which was needed for full marks. Part (ii) caused serious problems. Very few people correctly summed currents at the input node. Of those who tried most ignored the current through C_P and hence could not get the right answer. Part (iii) was a straightforward compare coefficients to find q factor. Those of you who didn't manage it usually made errors in the process I warned you about - converting the $1/(\omega_n q)$ into $1/q$. It is very frustrating for me when you stroll into traps that I told you were there. For part (iv) many people sketched a transient response magnitude response is a frequency domain response. In part (v) (a) very few realised that the GBP in the transfer function must be in radians per second and so the 4MHz needs multiplying by 2π. Most of you dispatched part (v) (b) well enough but some made very heavy weather of the algebra.

Q3: This question was attempted reasonably well – most of you managed the first two parts without too many problems. There was a big increase on recent years in the number of you who had problems like forgetting to square the potential dividers operating on the various noise power sources. There were the usual careless errors caused by saying $R_1//R_2 = 0.67$, forgetting the kΩ unit that should have been there. It's always dangerous to strip the kΩ from the number. Most people managed to find the temperature that would let R_{TH} account for the noise. Part (b) suffered from disorganisation in most attempts. Those who wrote down in relationship between the measured noise voltage and the equivalent input sources usually managed to get the right answer ..... but they were in the minority.

Q4: Attempts at question 4 were mixed. For part (i) many people told me advantages and disadvantages but I asked what is meant by the terms; I was looking for the differences in conduction behaviour of the output devices. Part (ii) was bookwork - some people knew it and some had a valiant attempt at making it up. Parts (iii) and (iv) were very mixed this year with people fretting about whether the power was peak power or RMS power. There has never been this concern before. RMS power is a meaningless term and peak power is not a useful measure with a sinusoidal source because it is entirely predictable. Part (v) was asking you to define the specs that must be met for the output device to survive in this application. A reasonable number got the current and power rating but I don't think anybody got the voltage rating which must of course be 2 V_S. In part (vi), those of you who read the question properly realised that since each output device consisted of three sub devices, each of which was mounted on a single heatsink (ie, three sub devices per heatsink and one heatsink for each output device). The slightest error here led to a negative thermal resistance for the heatsink but many of you ignored the negative sign ... and lost an extra mark; you can't as engineers just pretend that unpalatable results don't exist.

some horrible algebra perpetrated by quite a few of you this year ....

(a) $a = b + \frac{1}{c}$ therefore $\frac{1}{a} = \frac{1}{b} + c$ (b) $a = b + c$ therefore $a^2 = b^2 + c^2$

(c) $|a + jb| = a + b$