Feedback on ME10305 Mathematics 2, May 2018

This paper scraped in with an average in the very high 60s and therefore the marks were not moderated downwards as they have been for the last few years. I had heard through the grapevine that some students found this to be a very long paper, but I don't think that this produced any more than a few students who ran out of time, judging what I saw on the scripts.

No-one achieved full marks but there were two students with 99% and four with 98%. On the other hand there were 16 failures where the lowest two marks were a 6% and a 1%; I guess there was a lack of engagement somewhere along the line...

As usual, the great majority answered the questions in numerical order.

Q1. ODEs. Average: 7.3/10

Part (a) was generally very well done. Some didn't translate the boundary conditions into the new notation.

Part (b). The worst part for this question. When finding the Integrating Factor the minus sign also has to be used.

Part (c). Pretty good. Very many remembered to use the "replace the e^c by A" trick and the solution then followed like a dream.

Q2. Laplace Transforms. Average: 8.0/10.

Part (a) was bookwork. Almost no-one tripped up.

Part (b). Also bookwork. Mostly done correctly. A few quoted the formula book, but they got zero marks for that.

Part (c). The partial fractions was straightforward but a little lengthy.

Q3. Determinants/Gaussian Elimination. Average: 8.3/10.

Both parts were done well. Mistakes, whenever they arose, tended to be arithmetical.

Q4. Fourier Series. Average: 6.6/10.

Part (a). The sketch was frequently done incorrectly. The most common error was to stretch the given function, which was defined in the range, $-\pi < t < \pi$, to fit the range, $-3\pi < t < 3\pi$, and also with just one minimum. There should have been three repetitions of what is contained in $-\pi < t < \pi$.

An unusually large number of people used symmetry arguments to obtain $B_n = 0$. I guess that I must have taught that aspect really well; I wish I could remember what I did differently....

Part (b). Very many missed this out. Of those who did it, the most frequent error was the omission of the summation symbol.

Q5. Least Squares. Average: 8.0/10.

The question asked for the theory to be developed and three marks were associated with that. Quite a few only quoted the correct formulae, but I couldn't assign any marks for that. Otherwise a piece of cake.

Part (b) was a little novel for the exam context, but was done well.

Q6. Iteration schemes and root finding. Average: 7.4/10.

Part (a) was excellent. The perturbation analysis in Part (b) which led to a two-term binomial expansion was frequently either left out or else guessed at.

Q7. ODE solutions. Average: 4.9/10

This question attracted the lowest average mark. I thought that it was a gift and was worried that it would contribute to too high a mark overall. However, the low average was due mainly to the correctly-derived auxiliary equation, $\lambda^2 + 1 = 0$, being assigned the solution, $\lambda = \pm 1$, rather than the correct $\lambda = \pm j$.

Q8. Laplace Transforms. Average 5.7/10.

A highly technical question, unlike the rest of the paper, but with quite a bit of bookwork. It was a verbatim repetition of a previous year's question and it was clear that this had been solved previously by many students during revision for, in many cases, the correct answers were given but the intermediate workings were either absent or completely incorrect.

Q9. Eigenvalues, eigenvectors and solving system of ODEs. Average 7.9/10.

Part (a). Very good in general. The zero eigenvalue confused some. For some reason one of the eigenvectors for the $\lambda = 1$ case was quoted as being a zero vector by a sizeable minority.

Part (b). The general solution was written almost universally well. However, I chose to use one of the eigenvectors as the initial condition for the ODEs, and therefore it wasn't necessary to use Gaussian Elimination to find the coefficients. Only about half a dozen saw that particular Easter egg.

Q10. Miscellaneous. Average 4.9/10,

Part (a). Very well done. Essentially bookwork.

Parts (b) and (c). These parts were answered either very well or very poorly.

Dr. D. Andrew S. Rees
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