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| **EXAM ASSESSMENT GENERIC FEEDBACK FORM** |
| **UNIT NUMBER****AND TITLE** | **ME20021**Modelling Techniques 2 | **UNIT CONVENOR(S)**Dr D N JohnstonDr D A S Rees |
| **DATE** | **15th May 2017** |
| **QUESTION 1** | (a) Most recognised this as Jacobi’s method and most described it correctly. You needed to ‘reverse engineer’ the code to identify the original PDE, $\frac{∂^{2}u}{∂x^{2}}+\frac{∂^{2}u}{∂y^{2}}=S$, not just the finite difference approximation. It’s worth writing out the PDE in mathematical notation, not just by name. Some mistook Poisson’s equation for Laplace’s equation.(b) The notation and comments in the code imply a fluid flow problem – steady flow in a 40mm x 40mm passageway.(c) The best change was to the SOR method and most people got that. Both this and the Gauss-Seidel method require loops to be used, not vector algebra which won’t use the ‘new’ values correctly. Most people missed this key point. |
| **QUESTION 2** | (a) Mostly fine, but justify the use of symmetry to eliminate points outside the grid.(b) Generally good. Most laid it out clearly, and got the right answers. If you got the maths right then *p*=0.25, simplifying the equations nicely.(c) Here it was acceptable to state the finite difference approximations to the derivatives, but deriving them from Taylors series was fine too. The time derivative should use forward differencing, and the first spatial derivative should use central differencing. For the centre point, L’Hopital’s rule needed to be used to eliminate the 1/*r* (=1/0) term, and a Neumann symmetry boundary has to be used to eliminate terms outside the grid. |

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| **QUESTION 3** | Parts (a), (b) and (d) generally done well. The proffered solutions to part (c), the sketch, was astonishingly badly done. Only 20 students out of the 180 or so who answered this part got it correct. The initial temperature profile was linear, whereas 160 sketched a parabola (which is the example in my online notes!). |
| **QUESTION 4** | Unusually this was the better-received question. The average mark was just over 30 out of the maximum of 33, and many got it perfectly correct. Clearly I will need to make this question more difficult and/or longer next time. |