Department of Mechanical Engineering

UNIVERSITY OF BATH

EXAM ASSESSMENT GENERIC FEEDBACK FORM		
UNIT NUMBER AND TITLE	**ME20021** Modelling Techniques 2	**UNIT CONVENOR(S)** Dr D N Johnston Dr D A S Rees
DATE	**14th May 2019**	
QUESTION 1	(a) Generally well done. Make clear that central differencing is an approximation and not exact. (b) Generally well done. A few comments to guide the examiner through the derivation can be helpful. (c) Good. Some ambiguity over whether u_1^2 or velocity V_i^1 should be the subject of the equation; credit was given for both. (d) Mixed results. Make sure formulae go in the right place using proper Matlab syntax. Initial velocity can be a vector; using a matrix is inefficient. The timestep was deliberately omitted from the question, as it can be calculated as dx/c. (e) A description of aliasing and its avoidance using low-pass filters and high sample rates is needed here.	
QUESTION 2	(a) Show that it satisfies the criteria for L'Hopital's theorem (f and g -> 0). (b) Bear in mind that r in the PDE is the radius of the ith point, not the outside radius. Note that NX=4, not 3, as the radius is 6mm and step 2mm, and the differencing equations are applied to points i=1 to 3. Allowance was made for any confusion due to this. (c) As part b. (d) Robin boundary can be applied to represent convection (radiation is probably minor). Note that boiling may take place, changing heat transfer in a complex way and probably making it asymmetric. May need to use CFD to handle this properly.	

QUESTION 3	Generally quite well done. The chief error was the initial substitution of $T(r,\theta) = R(r) \sin n\theta$ instead of $R(r) \cos n\theta$. The latter conforms with the symmetry of the boundary condition on the outside of the cylinder, which is an even function of θ. Approximately 1/3rd students did this, and most followed up with an correct integration by parts but an incorrect substitution of the limits to obtain a Fourier Series consisting of sines. Of the rest, some forgot the $A_0/2$ term. For part (b) the solution is given by replacing the r^n from part (a) with r^{-n}. There was no need to rederive the solution and the Fourier series.
QUESTION 4	The question on Fourier Transforms is usually the 'desperation' question when all has gone wrong on the first three questions, or the 'I am so very happy' question when the first three have gone well. On this occasion the great majority of students answered this one very well indeed. There were a few who tried to hide a sign error in part (a) by quoting the right answer even though the previous line was incorrect.