Name ______________________________

Multistage Interconnection Networks

EE 7700-2

Midterm Examination

13 October 1993, 13:40-14:30

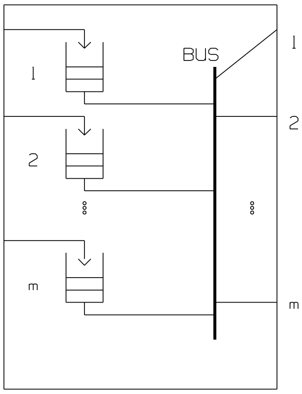
This exam has been modified so that the notation is consistent with EE 7725 Fall 1994.

Problem 1	________	(33 pts)
Problem 2	________	(33 pts)
Problem 3	________	(34 pts)
Exam Total	________	(100 pts)

Alias ______________________________

Good Luck!

Problem 1: In the cell design illustrated below the queues are connected to the output links by a bus (instead of a crossbar). This limits the number of packets that can leave a cell in a cycle to no more than one. Find expressions for the arrival rate, r_i, and the service rate v_i, where i is the stage number. Use the assumptions and techniques used in the iterative analysis of the omega network; show expressions for $i = 0$ and $i = s - 1$ (the number of stages) as well as the general case. (33pts)



Problem 2: An (s, m, m^{s-1}, S, T) omega network is being considered for use in a parallel system; the value of m is to be chosen.

Part 1: Find the cost of the network in crosspoints taking into account the width of the datapath, w. (In a crossbar there should be w crosspoints for each input/output pair.) (8pts)

Part 2: Suppose the expected waiting time in each cell in all stages is $\frac{3\lambda}{3-4\lambda}$ where λ is the arrival rate in bytes per clock cycle. Find the expected network latency. (12pts)

Part 3: Next, write the utilization equation in a form which can be used to find the value of m which gives the highest utilization. The total cost (in crosspoints) is fixed at C, the number of inputs, tasks, message size, computation and response time are fixed at N, P, M, t_m, and t_p respectively. The equation must be in a form which can be differentiated with respect to m. (Do not attempt the differentiation during the test.) (13pts)

Problem 3: Answer all of the questions below. Be as brief and as specific as possible.

Part 1: Which is faster, trace driven simulation or execution driven simulation? Explain. (10pts)
Material not covered for 94 midterm.

Part 2: Examining the utilization equation, it can be seen that utilization can be increased by making P larger. How can P be made larger? (In this case don't be too specific.) What expertise is required? If P is made larger, which other variable(s) is(are) likely to change? Explain. (10pts)

Part 3: Give three examples of requests (source/destination pairs) which pass through cell 790 in stage 3 a $(6,(2,3,7,2,5,4),-,S,T)$ network. (14pts)