**Interconnection Networks for High-Performance Systems**

ECE 6115 / CS 8803 – ICN

Spring 2020

**Lab 2: Topology Comparison - Questions**

**Answer the following Questions in place.**

***This is an individual assignment. Please do not post the solutions on Piazza. You are also not allowed to discuss the solutions with each other.***

**Note: If two or more topologies are identical in performance, list all of them in the answer.**

**Configuration A: Equal Link Widths [7 pts]**

**QA.1: Which topology provides the lowest load-load latency across the majority (at least two out of three) of traffic patterns? Why? [1 pt]**

**QA.2: Which topology provides the highest throughput across the majority (at least two out of three) of traffic patterns. Why? [1 pt]**

**QA.3: Do all topologies provide identical low-load latency for neighbor traffic? If yes, why? If no, why not? [1 pt]**

**QA.4: Can you suggest some change to the Flattened Butterfly that will provide the same latency and throughput for *Tornado* traffic, but reduce the total number of links? [4 pts]**

**Configuration B: Equal Bisection Bandwidth. [13 pts]**

**QB.1: Which topology provides the lowest load-load latency across the majority (at least two out of three) of traffic patterns? Why? [2 pts]**

**QB.2: Which topology provides the highest throughput across the majority (at least two out of three) of traffic patterns. Why? [2 pts]**

**QB.3: What are the links widths in each topology? [2 pts]**

Mesh: 32b

Flattened Butterfly:

Hierarchical Ring:

**Recall the network latency equation. Which component of the total network latency does the link width affect? [2 pts]**

*[Hint: Look at total packets injected vs total flits injected across these topologies]*

**QB.4: Assuming that the Mesh and Flattened Butterfly have the same router latency *t\_r*, determine the minimum value of *t\_r* for which the flattened butterfly will have lower packet latency than the mesh at low-loads for uniform random traffic. [5 pts]**

*[Hint: you can vary the router-latency parameter during the simulation for this question].*