National University of Computer and Emerging Sciences

Lahore Campus

Quiz 5
Total Marks : 5
Time allowed: 5 Minute
Date: March 25th , 2025

Q1: [5 Marks] When we use e-cube routing in a hyper-cube, why the worst-case cost of circular shift is $\mathbf{t_s + m.t_w}$ (without any multiplicative factor)?

Solution: E-cube routing in ***d*** dimensions gives us $\mathbf{2^d}$ un-contended, concurrent communication paths. For example, for 3-dimensional cube, there exist a sending/receiving schedule such that we can send 8 items (one per node) to some other node (q distance away, where q is the circular shift amount).

So, such 8 transmissions can happen in one time step using E-cube routing. Hence there is no multiplicative factor with our basic cost formula for the circular shift. Note that it was possible to do so because in circular shift each data item needs to move the same distance q.