1. (20 pts) Calculate (a) node degree, (b) diameter, (c) the number of links for an $n \times n$ extended mesh (see page 207).
2. (20 pts) Binomial coefficient \( \binom{n}{k} \) can be calculated in a tabular format (Pascal’s triangle) based on \( \binom{n}{k} = \binom{n-1}{k} + \binom{n-1}{k-1} \). Provide a DCDL implementation of \( \binom{n}{k} \) and use one process for each binomial coefficient. Note that \( \binom{n}{n} = \binom{n}{0} = 1 \). Demonstrate the correctness of your solution using \( \binom{4}{2} \).
3. (20 pts) Provide linear and vector clocks for all the events in the system given in Problem 2 of Chapter 3 (page 101). Assume that $LC'$s for $P_1$, $P_2$, $P_3$ are initialized to 1, 2, and 0, respectively. $d'$s for $P_1$, $P_2$, $P_3$ are 2, 1, and 2, respectively.
4. (20 pts) In Figure 6.2 (page 179), find the shortest distance from $P_i$ to $P_l$, where $i = 2, 3, 4, 5$ using (a) Dijkstra’s algorithm and (b) Bellman and Ford’s algorithm.
5. (20 pts) Recently (in July issue of IEEE TC), Chiu proposed an odd-even turn model, which is an extension to Glass and Ni’s turn model. The odd-even turn model tries to prevent the formation of the rightmost column segment of a cycle. Two rules for turn are given in:

- Rule 1: Any packet is not allowed to take an EN (east-north) turn at any nodes located in an even column, and it is not allowed to take an NW turn at any nodes located in an odd column.

- Rule 2: Any packet is not allowed to take an ES turn at any nodes located in an even column, and it is not allowed to take a SW turn at any nodes located in an odd column.

(a) Use your own word to explain that the odd-even turn model is deadlock-free.

(b) Show all the shortest paths (permissible under the extended odd-even turn model) for

(a) $s_1 : (0, 0)$ and $d_1 : (2, 2)$ and (b) $s_2 : (0, 0)$ and $d_2 : (3, 2)$