CME 451 – Transport Networks – Winter 2016
Assignment 5
Due Date: April 1, 2016

This assignment contains 11 problems. Completed assignments must be submitted on the specified due date by 4:30pm in the CME451 assignment box (second floor, across Room 2C94E). Late assignments will not be marked, and will be given a mark of zero.

Marking scheme:

- 30% completion mark
- 70% based on a selected set of problems (to be determined by the marker)

Note to students: in the following you will NOT find full solutions, but instead sufficient hints towards the full solutions. When appropriate, pointers to appropriate lecture slides are provided in parentheses. When in doubt, feel free to contact the teaching assistant or the instructor for further help on your assignments.

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1. Read chapters 9, 10 (Iniewski textbook).
2. Classify switching schemes based on protocols. Which scheme is most susceptible to irregular traffic patterns, and why?

   Solution: (C09, Slide 8, 11). Classify based on three protocols, and explain how hotspot can occur in switching of cells and/or packets.

3. Define Quality of Service (QoS), and provide three examples along with their application scenarios.

   Solution: (C09, Slide 12) Give conceptual definition, and provide examples along with applications in broadcasting, real-time communication, etc.

4. Let $N = 6$. Give a valid egress vector for broadcast. How many possible vectors are there for broadcast?

Solution: (C09, Slides 9, 13), recall that broadcast is a one-to-all scheme, so that all elements of the vector should be identical.

5. Classify whether each of the following egress vectors is speedup, slowdown or symmetric: (a) [3,7,2]; (b) [0,4,1,3]; (c) [3,3,3,3]. Explain your answers.

Solution: (C09, Slide 19), noting that some cases may be ambiguous, i.e., satisfying multiple cases.

6. Draw a Clos network with $r = 3$, $n = 2$ and speedup = 1.5. Is this a practical design?

Solution: (C09, Slides 24-25); figure/graph to be shown in class for $C(n,m,r) = C(2,3,3)$

7. Show all the intermediate steps in going from Fig. 9.21 to Fig. 9.22 in the textbook. (Hint: specify IngressOpens, EgressOpens and OpenCenters).

Solution: as shown in class, taking into account the intersection of the various sets.

8. Draw the graph representation corresponding to Fig. 9.31.

Solution: graph should take into account multicasting, with each color/line type representing a different center-stage device.

9. Refer to Fig. 10.13. Write the trajectory through time and space for: q, r.

Solution: graph showing how multicasting lead to multiple trajectories.

10. Draw the trajectory for subset permutation 3 in Figure 10.16.

Solution: note that permutation 3 means that all connections in this subset are routed through with suffix of 3.

11. Refer to Fig. 10.17. Assuming the ingress & egress ports in the following are not yet connected, add the connection between: C3 (ingress) and A1 (egress). Also, write the trajectory for this connection.

Solution: first, provide a routing that has no collision in terms of color/line type (e.g., permutation 1 should be suitable); then, draw the corresponding trajectory.