## York University

## EECS 6117

## Homework Assignment #4Due: February 17, 2023 at 5:00 p.m.

1. Consider a synchronous message-passing system of n processes with process ids 1, 2, ..., n. The network graph is complete. Up to f processes may experience Byzantine failures.

Consider the problem of majority consensus, where each process gets an input value and the following three properties must be satisfied:

- Termination: Each correct process must eventually produce an output.
- Agreement: Output values of all correct processes must be the same.
- Majority validity: If at least two thirds of the correct processes have the same input value v, then all correct processes output v.
- (a) Is this problem solvable when n = 4 and f = 1? Show your answer is correct.
- (b) Find a function  $g_1(f)$  such that the problem is unsolvable if  $n \leq g_1(f)$ . The bigger the values of your  $g_1$  function, the better.
- (c) Find a function  $g_2(f)$  and give an algorithm to solve the problem if  $n \ge g_2(f)$ .

The smaller the values of your  $g_2$  function, the better. Obviously,  $g_2(f)$  must be greater than  $g_1(f)$ . Ideally,  $g_2(f)$  should be just a *little bit* bigger than  $g_1(f)$ .

Hint: you could first use the standard Byzantine consensus algorithm to agree on the input values of process i for all i.