CS 425/ECE 428 Distributed Systems (Spring 2016) Total 20 points
Homework 5 ----- Due: By 7 p.m. Tuesday, March 8, 2016 -- Submit via Compass2g

1. (10 points) The execution in the file below shows application messages sent by three processes. Suppose that process P2 initiates the Chandy-Lamport snapshot algorithm at time marked by X on the execution of P2. The marker messages are not shown in the figure. Recall that the snapshot algorithm saves channel states and process states both.

(a) What is the smallest number of messages that may be recorded by the snapshot algorithm? Write the channel states that are recorded as non-empty in this case (e.g., channel P1→ P3 = {m1} if that happens to be correct).

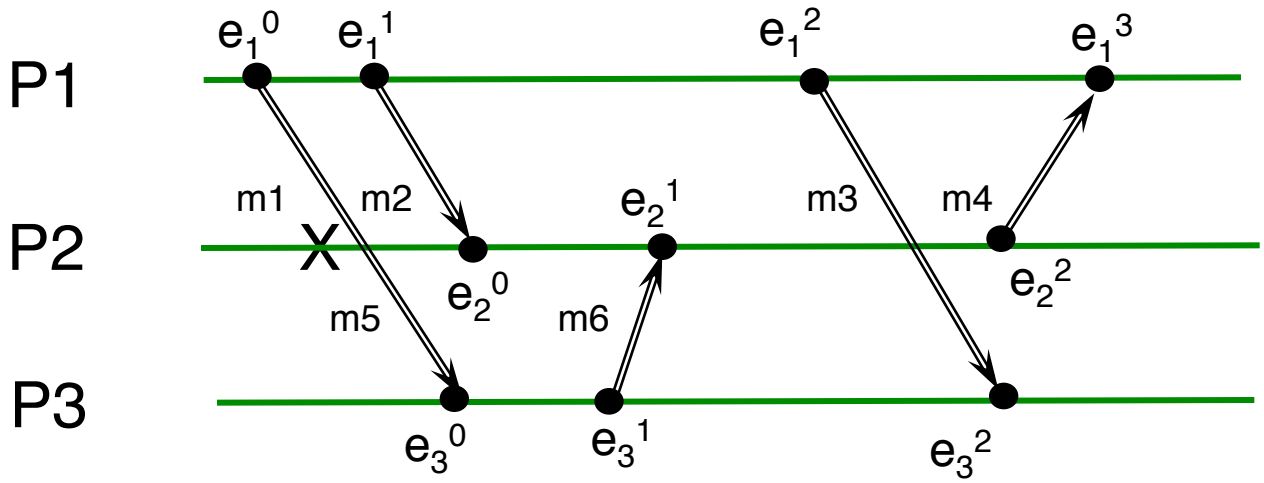
(b) What is the largest number of messages that may be recorded by the snapshot algorithm? Write the channel states that are recorded as non-empty in this case.

2. (5 points) Consider the Byzantine generals algorithm in the textbook (or the slides) for 4 processes. Does the algorithm work correctly if the input can be any value in the set {0,1,2}? In this case, define *majority* of 3 values as the value that appears at least twice among the three values; if no such value exists, then the smallest of the three values is chosen as the *majority*.

Answer Yes or No, with a brief explanation

3. (5 points) Consider the Ricart-Agrawala algorithm for mutual exclusion. The algorithm uses a 2-tuple of the form <Lamport timestamp, process id> to label the requests. If we change the label to <process id, Lamport timestamp>, while performing lexicographic comparison (with leftmost element of the tuple being most significant), will the modified algorithm still remain correct? (i.e., ensure mutual exclusion and liveness).

Answer Yes or No, with a brief explanation.


P1
P2
P3
e_1^0
e_1^1
e_1^2
e_1^3
m1
m2
e_2^1
m3
m4
X
e_2^0
e_2^2
m5
m6
e_3^0
e_3^1
e_3^2