## Please type your answers (e.g., using Latex, or Word).

See the policy of 48-hour extension described in the course handout.

1. Reading assignment: Paxos made simple, Leslie Lamport, 2001, available from http://research.microsoft.com/en-us/um/people/lamport/pubs/paxos-simple.pdf

Using a timeline showing when processor(s) issue "proposals" and "accept" requests, along with a brief description of the scenario, explain why the Paxos algorithm may not make progress.

You may submit a hand-drawn figure for your solution above (or draw it using some software).

2. Consider the following read-modify-write operation on variable v:

```
Compare-and-swap (v, old_value, new_value)
{
  previous := v
  if (previous == old_value) then v := new_value
  return (previous)
}
```

Consensus can be achieved in an asynchronous shared memory system using the above shared memory object even if processors may crash. Provide a proof. (You can present an algorithm using the above object, and show that it is correct.)

You may assume that the shared memory variable is initialized to any desired value (possibly  $\perp$  or NULL, if necessary).

NOTE: A solution to the above problem may be found in the textbook. However, it is recommended that you try to develop the solution on your own. If that fails, you may review the relevant material in the textbook, and summarize the solution in your own words.