Supplement to Final Fall 99

Replace problem 3 in the final by the following problem on invariants.

Problem 3'[10 points] **Invariants**

(a) Give the definition of a *state invariant* of a state machine?

(b) Besides, the identically `false` and identically `true` state invariants, how many other logically distinct state invariants does the following machine have? Describe them. (Two invariants are logically distinct if there exists a state in which one holds and the other doesn't.)

State Machine Description:
States $Q ::= \{A, B, C, D, E, F, G, H\}$, transitions:

$$\{(A,B),(B,C),(C,A),(D,E),(E,F)(F,D),(C,D),(G,A),(B,H)\}.$$

Replace problem 9 in the final by the following problem on linear recurrence - same problem with an example .

problem 9'[15 points] **Linear Recurrence**

You just moved into your new house and you are throwing a housewarming party. You invite 5 people on the first day and tell them to invite their friends. Each newly invited person invites 2 people the day after they are invited.

(c) [5 points] Give a recurrence describing the total number of people invited by the nth day. This includes everyone – i.e the people you invited, and the people invited by the people you invited etc.

(E.g. On the first day 5 people were invited, by the second day 15 people were invited including the 5 people you invited on the 1st day and the 10 people they invited on the 2nd day, by the third day 35 people were invited etc).

(d) [5 points] Describe initial conditions for the recurrence.

(e) [5 points] Give a closed form expression equal to the number of people invited by the nth day.