PROBLEM SAMPLE 2

Q5 (18 points)

N customers enter the bakery to buy cookies. Each customer gets its ***turn[i]***, by computing a next **number**, and waits to be served. The clerk uses a counter to keep track of the served customers. The clerk serves the customer whose ***turn[i]*** is equal to the counter. After each `serve( )`, the clerk increments the counter. When the counter reaches ***N***, the clerk considers that it is done and leaves for home.

(**Shared variables**)

```
turn[i] = 0 i = 1, … , N   (N is initialized to 10)
number= 0;
served[i]=0;
counter = 0;
```

← checks for matching customer #

```
customer i ( ) {
number++;
turn[i] = number;
while (!served[i]){ };
getServed( );

go home;

}
```

```
clerk ( ){
while (counter < N){
        counter++;
 for( int j=1; j<=N; j++){
   if (counter ==turn[j] ){
        served[j] = True;
        serve( );  // simulated by sleep
        served[j] =False;} //if
 } // for
} // while
 leave;
} // clerk
```

All customer( ) and clerk( ) processes execute concurrently.

a) Is it possible for two customers to compute the same `number`? Explain. If yes, give the execution sequence that will show it.

$C_1 = \#3$ $C_2 = \#4$

b) Under the hypothesis that each customer has computed a different `number` value, is it possible for customers to compete for the same cookies (because their `turn[i]` is the same)? Explain. If yes, give the execution sequence that will show it.

can they have same value for turn? Yes

c) Under the hypothesis that all customers have their `turn[i]` set before the clerk starts executing, is it possible for a customer to starve (busy wait forever)? Explain. If yes, give the execution sequence that will show it.

Can you have a cust. never going out of while loop?

d) Is it possible for the clerk to never go home? Explain. If yes, give the execution sequence that will show it.

e) If there are ***N*** cookies on the shelf, is it possible for the clerk to run out of cookies before all the customers got served? Explain. If yes, give the execution sequence that will show it.

(c) Turn = 2 and counter = 2, got to a customer and set val = T, when will I set it back to T? Cust will Busy wait forever.

- served val can be set to T and remain true

(d) clerk never gets out of while? No Busy waiting, so impossible

(e) Possible for cust to be served 2x?

Not possible.