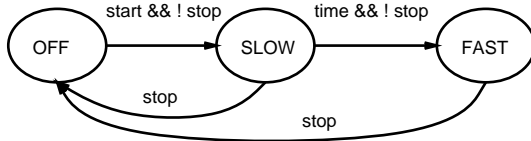# Solutions to Review Lecture II

## State Machines

The inputs are from two pushbuttons (start and stop) and from the timer circuit (time). The outputs to control the motor are run and slow and the output to control the timer is reset. The controller can be in three states: OFF, SLOW and FAST and the output values for each state are:

| State | run | slow | reset |
|-------|-----|------|-------|
| OFF   | 0   | 0    | 0     |
| SLOW  | 1   | 1    | 1     |
| RUN   | 1   | 0    | 0     |

The state transition diagram is as follows:



and it can be summarized in tabular form as:

| Starting State | Input | | | Next State |
|-------|------|-------|------|-------|
| | stop | start | time | |
| OFF   | 0 | 0 | X | OFF  |
| OFF   | 0 | 1 | X | SLOW |
| OFF   | 1 | X | X | OFF  |
| SLOW  | 0 | X | 0 | SLOW |
| SLOW  | 0 | X | 1 | FAST |
| SLOW  | 1 | X | X | OFF  |
| FAST  | 0 | X | X | FAST |
| FAST  | 1 | X | X | OFF  |

## C Programming

```
/* APSC 380 Review Lecture 2, Question 2 */

#define CONTROL 0x2e0
#define DATA    0x2e1
#define RXOK    0x01
#define LINK    0x08
#define TXOK    0x80

char cget( void )
{
    while ( ( peek(CONTROL) & (RXOK|LINK) ) != (RXOK|LINK) ) {
    }
    return peek ( DATA ) ;
}

void cput( char c )
{
    while ( ( peek(CONTROL) & (TXOK|LINK) ) != (TXOK|LINK) ) {
    }
    poke ( DATA, c ) ;
}
```