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April 10, 2006, 1:00pm-1:50pm.

(15) Question 1. The smallest possible \( t_1 \) clock period is 500ns
Data available = \( (t_2,t_2+t_1) = (10,200],t_2+10) \) worst case
Data required = \( (t_1/2-t_3,t_1/2+t_4) = (t_1/2-50,t_1/2+20) \)
Make Data Available overlap Data Required
\[
200 \leq t_2-50 \quad \text{and} \quad t_1/2+20 \leq t_1+10
\]
\[
500 \leq t_1 \quad \text{and} \quad 20 \leq t_1
\]

(15) Question 2. The resistor protects the TIP120 and 6812 if the motor were to short-circuit.

(15) Question 3. Design, equation and implementation

\[
\begin{align*}
\text{RAM} & : \$6000-$67FF \\
\text{YourDevice} & : \$7400-$77FF \\
\text{ROM} & : \$C000-$FFFF
\end{align*}
\]

Choose address lines A15, A12
Kmap, place 0 to activate, 1 to deactivate
Equation (either) Select * = A15 • A12 = A15 + A12

(5) Question 4. 1cm/1024

(10) Question 5. Give the proper values See Figure 7.40

CPHA = 0
CPOL = 0

If the memory interface were to be unsynchronized, the data out of the memory would conflict with the address out of the 6811 during the first half of the cycle (when E=0) during a read cycle.

(+5) Question 6. Answer A, B, C, D, E, or F

D

(20) Question 7a. Show the \texttt{InitFSM()} function

```c
void InitFSM(void){
    asm sei            // make ritual atomic
    Pt = S0;           // Initial state
    DDRM = 0x3E;       // PM0 is input, PTM5-1 output
    TIOS = 0x20;       // activate TC5 as output compare
    TSCR1 = 0x80;      // Enable TCNT
    TSCR2 = 0x02;      // prescale, 1MHz
    TIE = 0x20;        // arm
    TFLG1 = 0x20;      // clear C5F
    PTM = Pt->Out;     // output in first state
    TC5 = TCNT+Pt->Time; // time to wait in first state
    asm cli            // enable
}
```

(20) Question 7b. Show the output compare 5 ISR that executes the finite state machine.

```c
void interrupt 13 OC5handler(){
    unsigned char in;  // 0 or 1
    TFLG1 = 0x20;      // acknowledge, clear C5F flag
    in = PTM->0x01;    // Input=0 or 1
    Pt = Pt->Next[in]; // Next state depends on the input
    PTM = Pt->Out;
    TC5 = TC5+Pt->Time;
}
```