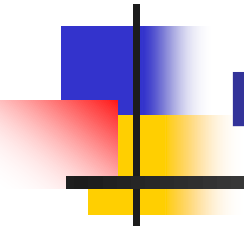

Microprocessor Systems

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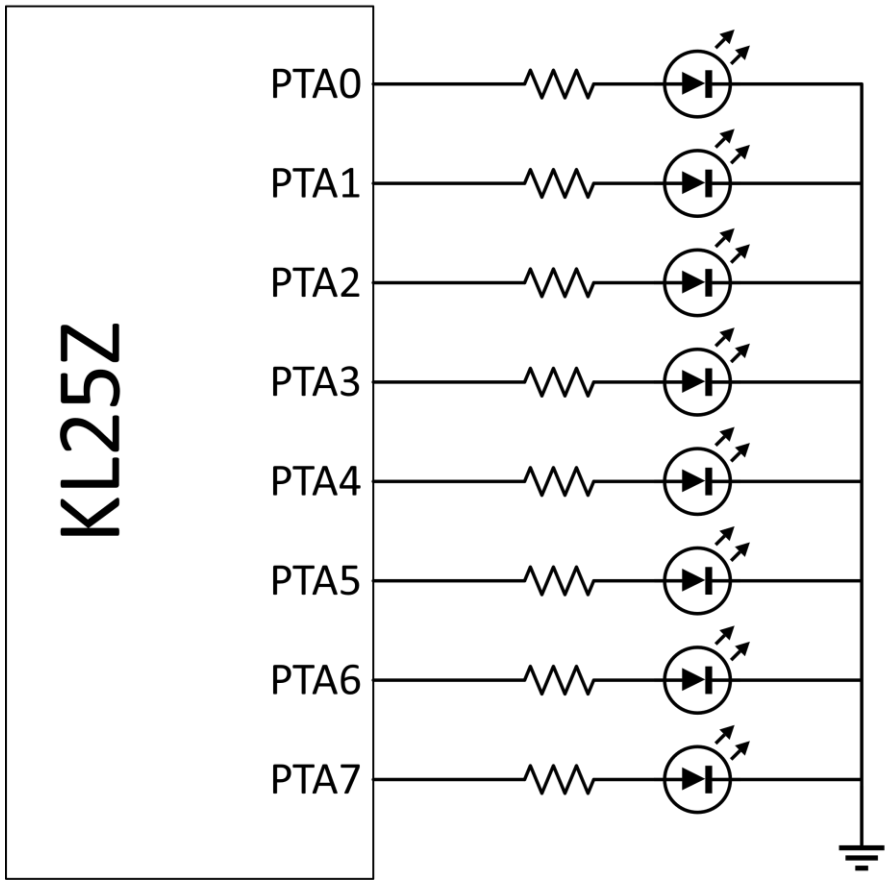
GPIO EXAMPLES

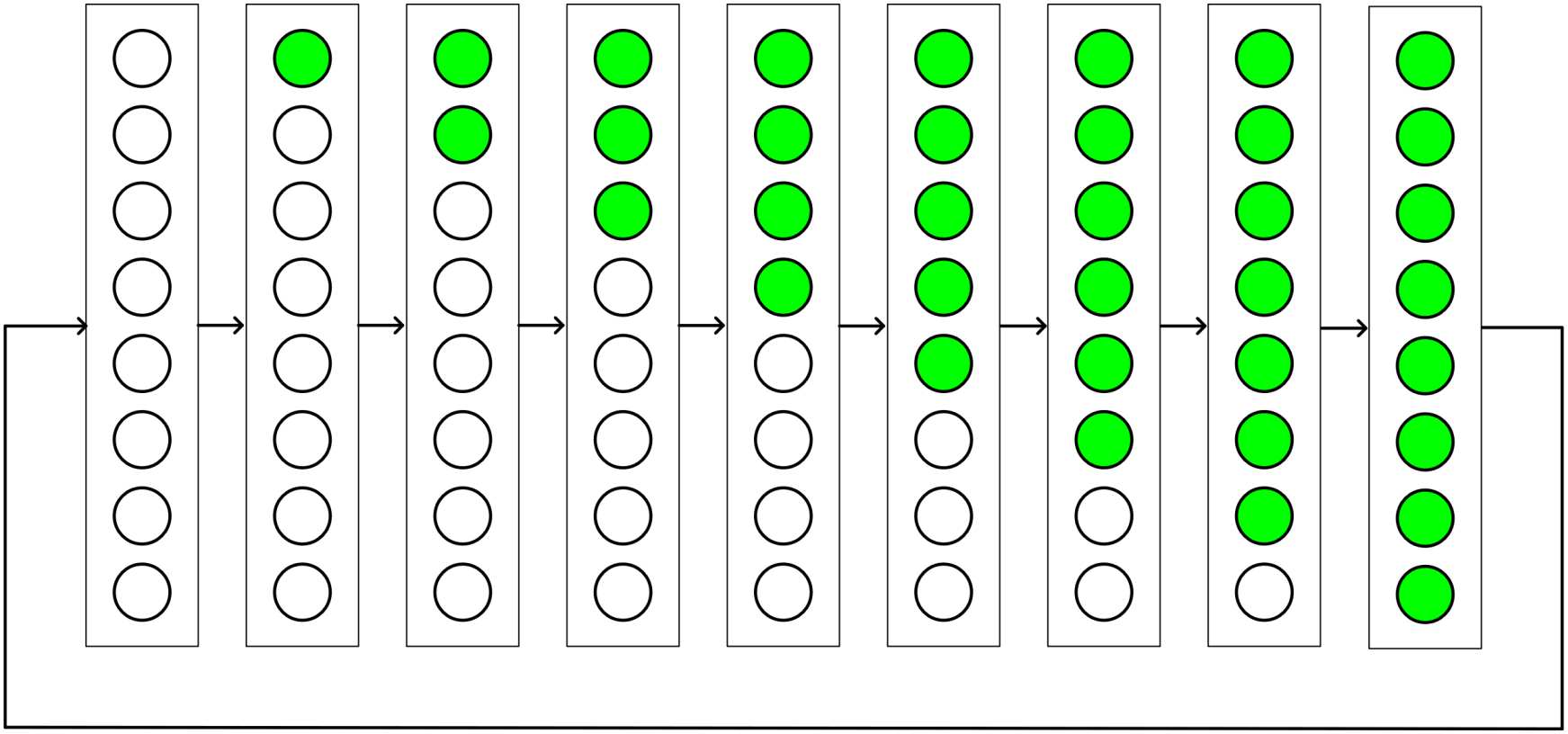
Question 1 – Common Cathode LEDs

- Write the C code to turn LEDs on and off according to Pattern 1 for Microcontroller Design 1.



Design 1

Question 1 – Common Cathode LEDs



Design 1

Question 1 – Solution

```
int main0(){
  int i=0;
  // Enable Clock to Port A
  SIM->SCGC5 |= SIM_SCGC5_PORTA_MASK;
  // Make 8 Pins GPIO
  for(i =0;i<8;i++){
    PORTA->PCR[i] &= ~PORT_PCR_MUX_MASK;
    PORTA->PCR[i] |= PORT_PCR_MUX(1);
  }
  //Set LED bits to output
  PTA->PDDR |= MASK(0) | MASK(1) | MASK(2) | MASK(3) |
               MASK(4) | MASK(5) | MASK(6) | MASK(7);

  i = 8;
  while(1){
    if(i == 8){
      //Clear first eight bits
      PTA -> PCOR = 0x000000FF;
      //Set i for the first led turn on
      i = 0;
    }else{
      //Set current GPIO pin to turn on LED
      PTA -> PSOR = MASK(i);
      //Increase the counter for next led
      i++;
    }
    //Wait short time to see LED
    Delay(200);
  }
}
```

Question 1 – Solution

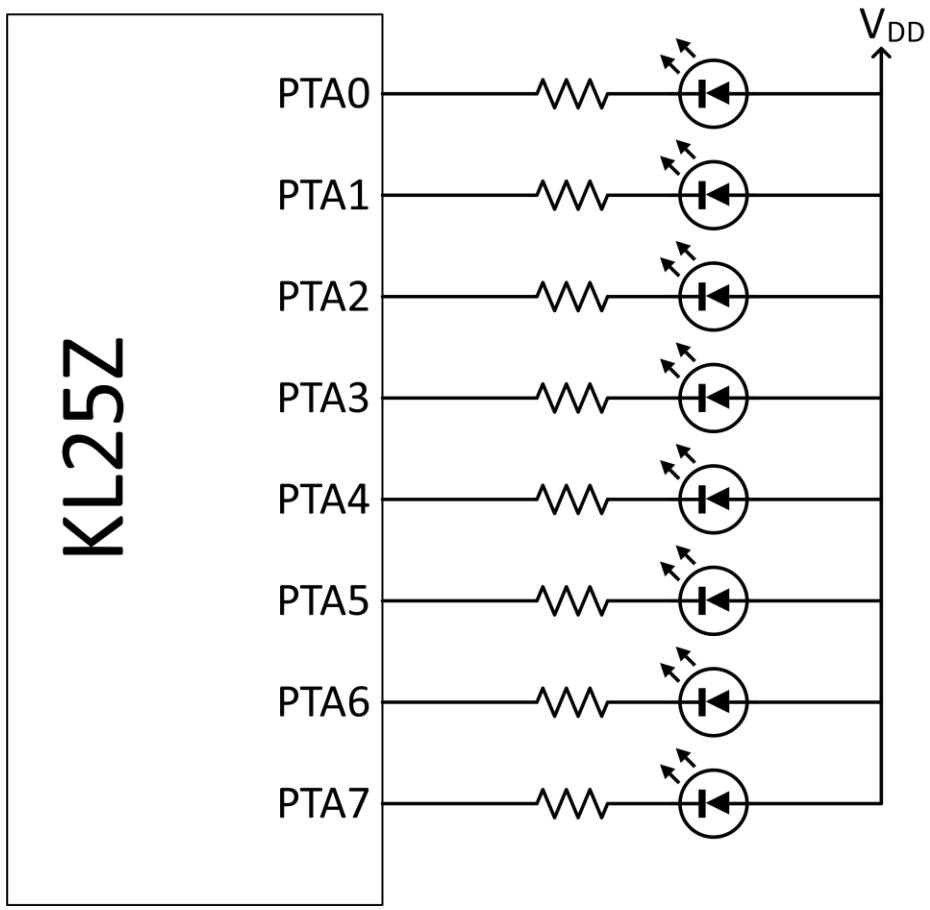
```
int main0(){
  int i=0;
  // Enable Clock to Port A
  SIM->SCGC5 |= SIM_SCGC5_PORTA_MASK;
  // Make 8 Pins GPIO
  for(i =0;i<8;i++){
    PORTA->PCR[i] &= ~PORT_PCR_MUX_MASK;
    PORTA->PCR[i] |= PORT_PCR_MUX(1);
  }
  //Set LED bits to output
  PTA->PDDR |= MASK(0) | MASK(1) | MASK(2) | MASK(3) |
               MASK(4) | MASK(5) | MASK(6) | MASK(7);
```

Question 1 – Solution

```
    i = 8;
    while(1){
      if(i == 8){
        //Clear first eight bits
        PTA -> PCOR = 0x000000FF;
        //Set i for the first led turn on
        i = 0;
      }else{
        //Set current GPIO pin to turn on LED
        PTA -> PSOR = MASK(i);
        //Increase the counter for next led
        i++;
      }
      //Wait short time to see LED
      Delay(200);
    }
}
```

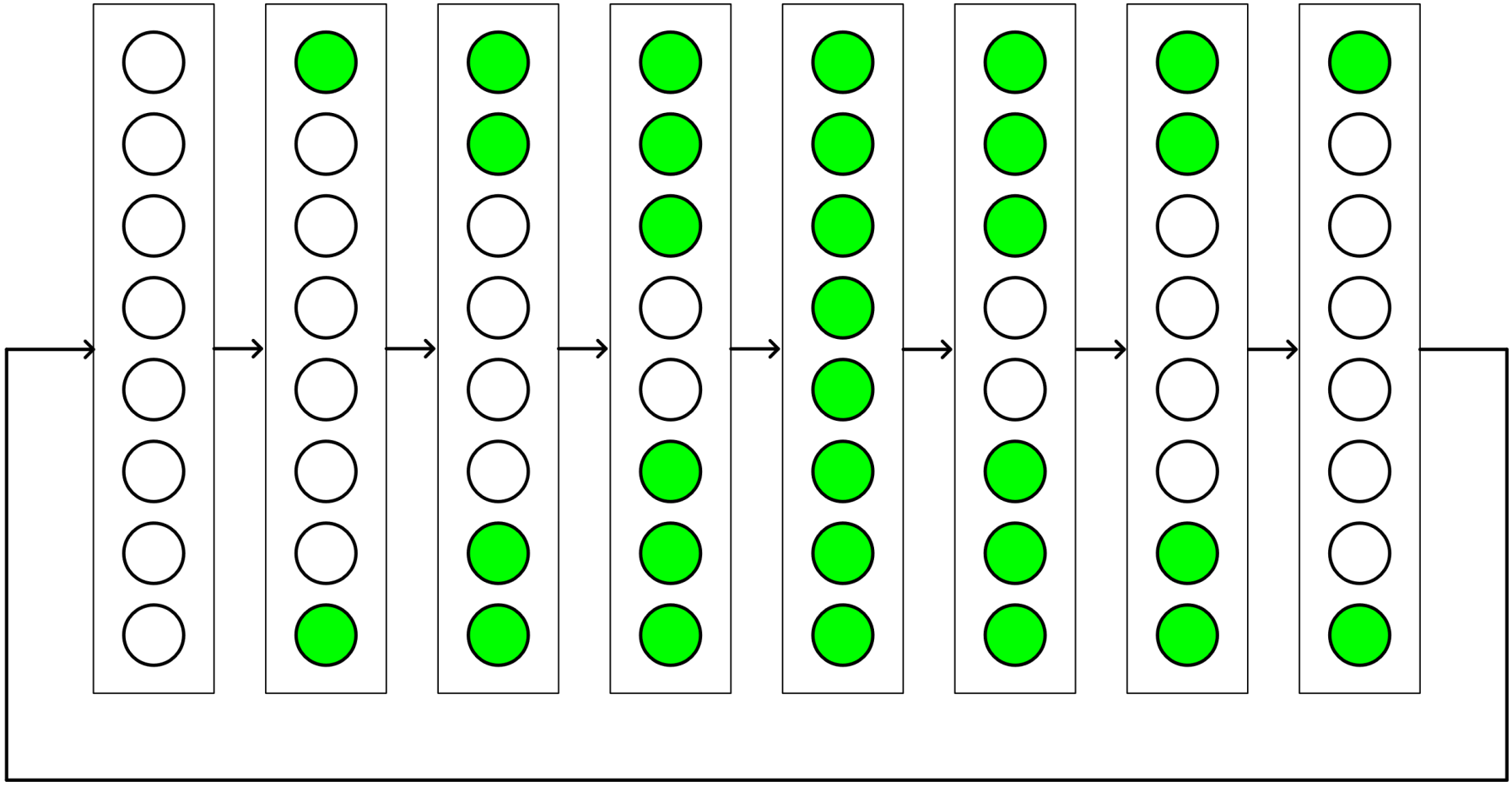
Question 2 – Common Anode LEDs

- Write the C code to turn LEDs on and off according to Pattern 2 for Microcontroller Design 2.



Design 2

Question 2 – Common Anode LEDs



Design 2

Question 2 – Solution

```
int main(){
  int i=0;
  // Enable Clock to Port A
  SIM->SCGC5 |= SIM_SCGC5_PORTA_MASK;
  // Make 8 Pins GPIO
  for(i =0;i<8;i++){
    PORTA->PCR[i] &= ~PORT_PCR_MUX_MASK;
    PORTA->PCR[i] |= PORT_PCR_MUX(1);
  }
  //Set LED bits to output
  PTA->PDDR |= MASK(0) | MASK(1) | MASK(2) | MASK(3) |
               MASK(4) | MASK(5) | MASK(6) | MASK(7);

  i = 0;
  //Set the first eight bit
  PTA -> PSOR = 0x000000FF;
  Delay(200);
  while(1){
    //Toggle ith pin an also (7-i) pin (reverse ith pin)
    PTA -> PTOR = MASK(i) | MASK(7-i);
    //Increase i, clear it if it is 8
    i = (i+1) % 8;

    //Wait short time to see LED
    Delay(200);
  }
}
```

Question 2 – Solution

```
int main(){
  int i=0;
  // Enable Clock to Port A
  SIM->SCGC5 |= SIM_SCGC5_PORTA_MASK;
  // Make 8 Pins GPIO
  for(i =0;i<8;i++){
    PORTA->PCR[i] &= ~PORT_PCR_MUX_MASK;
    PORTA->PCR[i] |= PORT_PCR_MUX(1);
  }
  //Set LED bits to output
  PTA->PDDR |= MASK(0) | MASK(1) | MASK(2) | MASK(3) |
               MASK(4) | MASK(5) | MASK(6) | MASK(7);
```

Question 2 – Solution

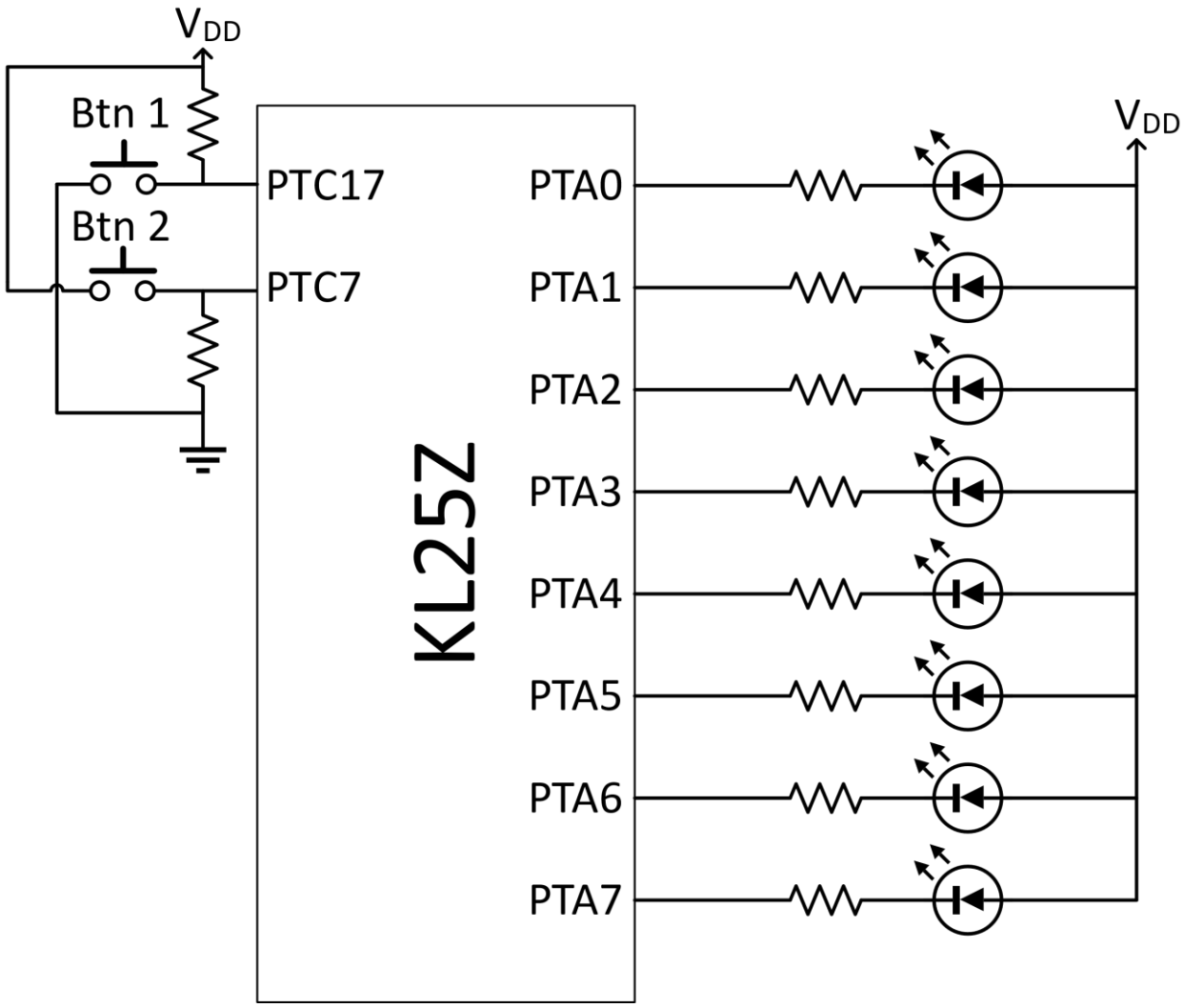
```
  i = 0;
  //Set the first eight bit
  PTA -> PSOR = 0x000000FF;
  Delay(200);
  while(1){
    //Toggle ith pin an also (7-i) pin (reverse ith pin)
    PTA -> PTOR = MASK(i) | MASK(7-i);
    //Increase i, clear it if it is 8
    i = (i+1) % 8;

    //Wait short time to see LED
    Delay(200);
  }
}
```

Question 3 – Switch Example

- Write the C code to turn LEDs on and off according to Pattern 1 while Button 1 is pressing and Pattern 2 while Button 2 is pressing for Microcontroller Design 3. Otherwise, the Microcontroller must stay in the same position.

Question 3 – Switch Example



Design 3

Question 3 – Solution

```
int main(){
  int i=0;
  // Enable Clock to Port A
  SIM->SCGC5 |= SIM_SCGC5_PORTA_MASK;
  // Make 8 Pins GPIO
  for(i =0;i<8;i++){
    PORTA->PCR[i] &= ~PORT_PCR_MUX_MASK;
    PORTA->PCR[i] |= PORT_PCR_MUX(1);
  }
  //Set LED bits to output
  PTA->PDDR |= MASK(0) | MASK(1) | MASK(2) | MASK(3) |
               MASK(4) | MASK(5) | MASK(6) | MASK(7);
```

Question 3 – Solution

```
// Enable Clock to Port C
SIM->SCGC5 |= SIM_SCGC5_PORTC_MASK;
//Set button 1 pin as GPIO
PORTC->PCR[17] &= ~PORT_PCR_MUX_MASK;
PORTC->PCR[17] |= PORT_PCR_MUX(1);
//Set button 2 pin as GPIO
PORTC->PCR[7] &= ~PORT_PCR_MUX_MASK;
PORTC->PCR[7] |= PORT_PCR_MUX(1);

//Set button 1 and button 2 bits to input
PTC->PDDR &= ~(MASK(17)|MASK(7));
```

Question 3 – Solution

```
int state = 0;

while(1){
   // Check PTC17 is zero or not
   if(~(PTC-> PDIR) & MASK(17)){
      //If state is changed clear operation
      if(state != 1){
        //Set i for turn of leds
        i = 8;
        //Set State as 1
        state = 1;
      }
      if(i == 8){
        //Set the first eight bit
        PTA -> PSOR = 0x000000FF;
        //Set i for the first led turn on
        i = 0;
      }else{
        //Set current GPIO pin to turn on LED
        PTA -> PCOR = MASK(i);
        //Increase the counter for next led
        i++;
      }
   }
```

Question 3 – Solution

```
    else if(PTC->PDIR & MASK(7)){
        if(state != 2){
          //Clear i for the first led turn on
          i = 0;
          //Set the first eight bit
          PTA -> PSOR = 0x000000FF;
          //Set state as 2
          state = 2;
        }else{
          //Toggle ith pin an also (7-i) pin (reverse ith pin)
          PTA -> PTOR = MASK(i) | MASK(7-i);
          //Increase i, clear it if it is 8
          i = (i+1) % 8;
        }

      }
    //Wait short time to see LED
    Delay(200);
  }
}
```