Digital and Embedded Systems
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Tutorial Optional A – I/O and Interrupts

1. C and Assembly

Write an **assembly subroutine** "average" that can be called from the following C main program. The subroutine should calculate the average of two 8-bit values.

```
char average(char a, char b);

int main()
{ DDRA = 0; DDRB = 0; /* input */
  DDRD = 0xFF;        /* output */

  while(1) PORTD = average(PINA, PINB);
}
```

2. Interrupts

Write an interrupt service routine in C counting the **falling edges** on port pin E0.

3. Serial Transmission

Assume a serial transmission using 1 start bit, 8 data bits, 1 odd parity bit, 2 stop bits.

At a transmission speed of 9600 Baud, how long does it take to say **"HI!"** ?

Draw the transmitted bit sequence for this message.