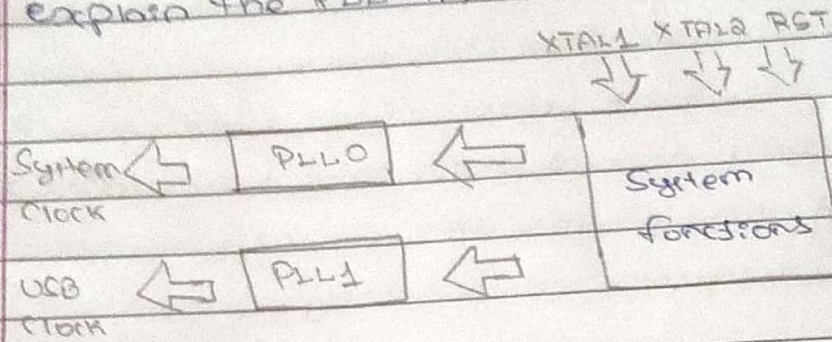


## Assignment 2 :

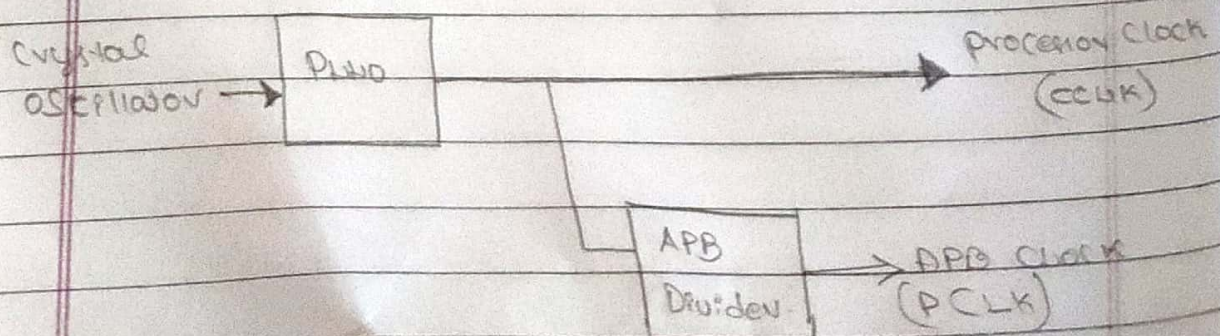
6

explain the PLL in LPC1114 with neat diagram.



- There are two PLL Modules in LPC1114 microcontroller i.e. PLL0 and PLL1
- PLL0 is used to generate the CLK or clock
- PLL1 is used to supply the clock for USB at the rate of 48MHz.
- These two PLL are identical with exception of PLL interrupt capabilities reserved only for the PLL0.
- PLL0 and PLL1 accept input clock frequency in range of 10MHz to 20MHz only.
- Input frequency is multiplied up the range of 10MHz to 60MHz for CLK to 48MHz for USB clock using Current Condition Oscillator.
- Multiplier can be integer value from 1 to 32.

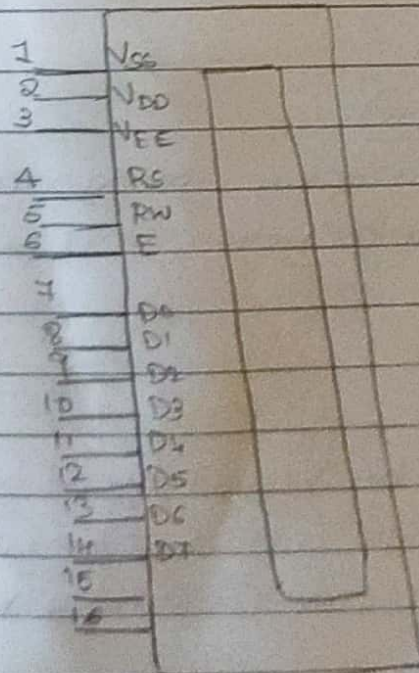
7. explain the clock working in LPC1114 with neat diagram.





- ARM7 LPC1114 Intercontroller needs two clocks one is the peripheral and other for CPU.
- CPU works faster with higher frequency whereas peripheral need lower frequency to work with.
- The PCLK and CCLK gets clock input from a PRC or from external source.
- After RESET, configuration of PRC and VPD Divider would be first thing to do.
- Peripheral clock i.e. PCLK divided from CPU clock.
- APB Divider decides the operating frequency of PCLK.
- Input to the APB divider is CCLK and output is PCLK. By default PCLK run at  $\frac{1}{4}$ th the speed of CCLK.

8. explain ucd pins with neat diagram.





- PIN 1 (Ground / Source Pin)

This is GND pin of display, used to connect the GND terminal of the microcontroller unit or power source.

- PIN 2 (Vcc / Source Pin)

This is the voltage supply pin of the display, used to connect supply pin of power source.

- PIN 3 (Vo / VEE / Control Pin)

This pin regulates difference of the display, used to connect a changeable pot that can supply 0 to 5V.

- PIN 4 (Register Select / Control Pin)

PIN toggles among data register, used to connect a microcontroller unit pin and obtain either 0/1.

- PIN 5 (Read / write)

PIN toggles the display among read / write operation & connected microcontroller unit pin of either 0/1.

- PIN 6 (Enable)

This PIN should be held high to execute read / write process, & it is connected to microcontroller unit & constantly held high.

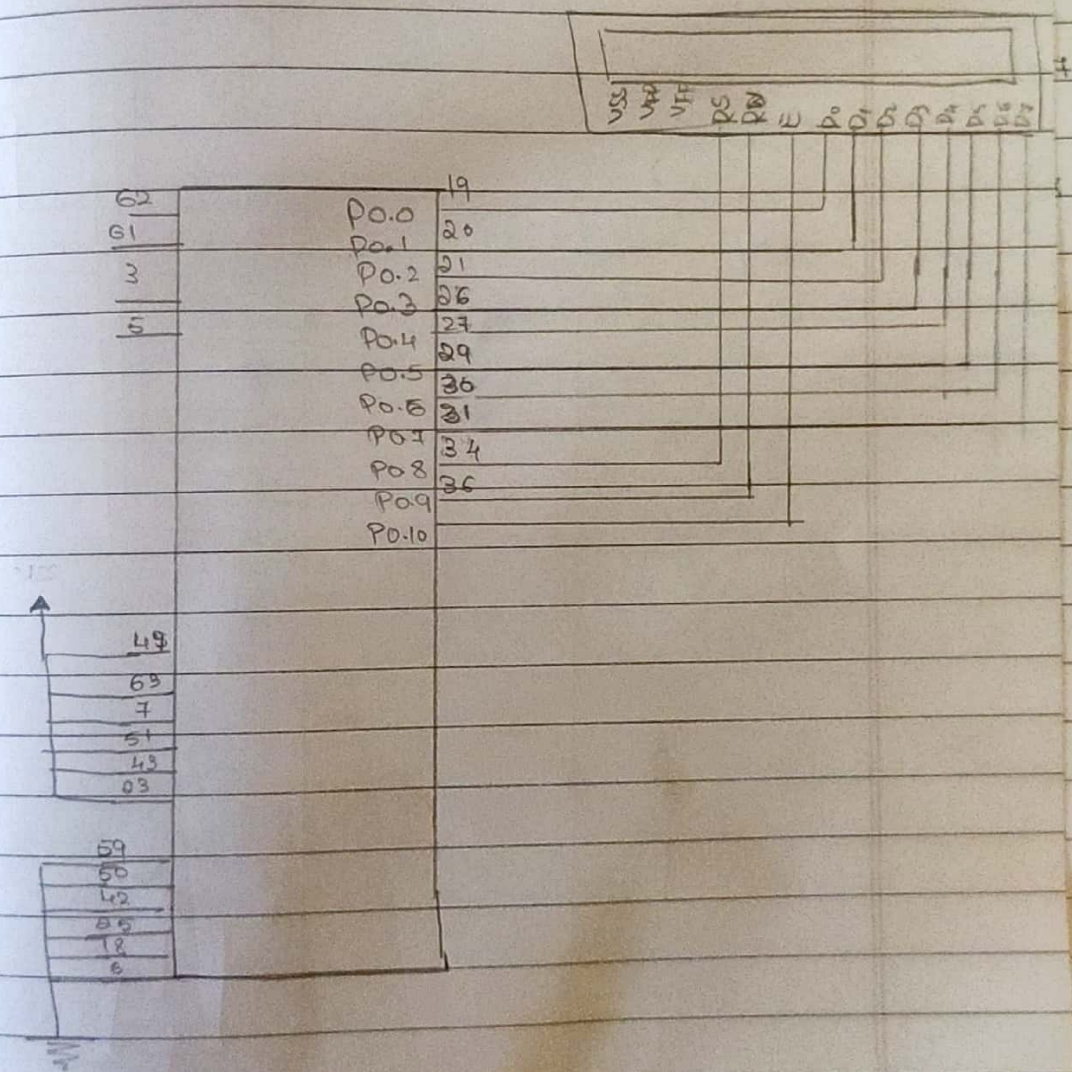
- PIN 7-14 (Data Pin): These pins are used to send data to the display. These pins are connected in two wire modes like twelve mode and 8 wire mode.



• PIN 15 (+ve pin of LED)  
→ PIN connected to +5V

• PIN 16 (-ve pin of LED)  
PIN connected to GND

9. LCD interfacing with 4 bit mode with LPC1114.



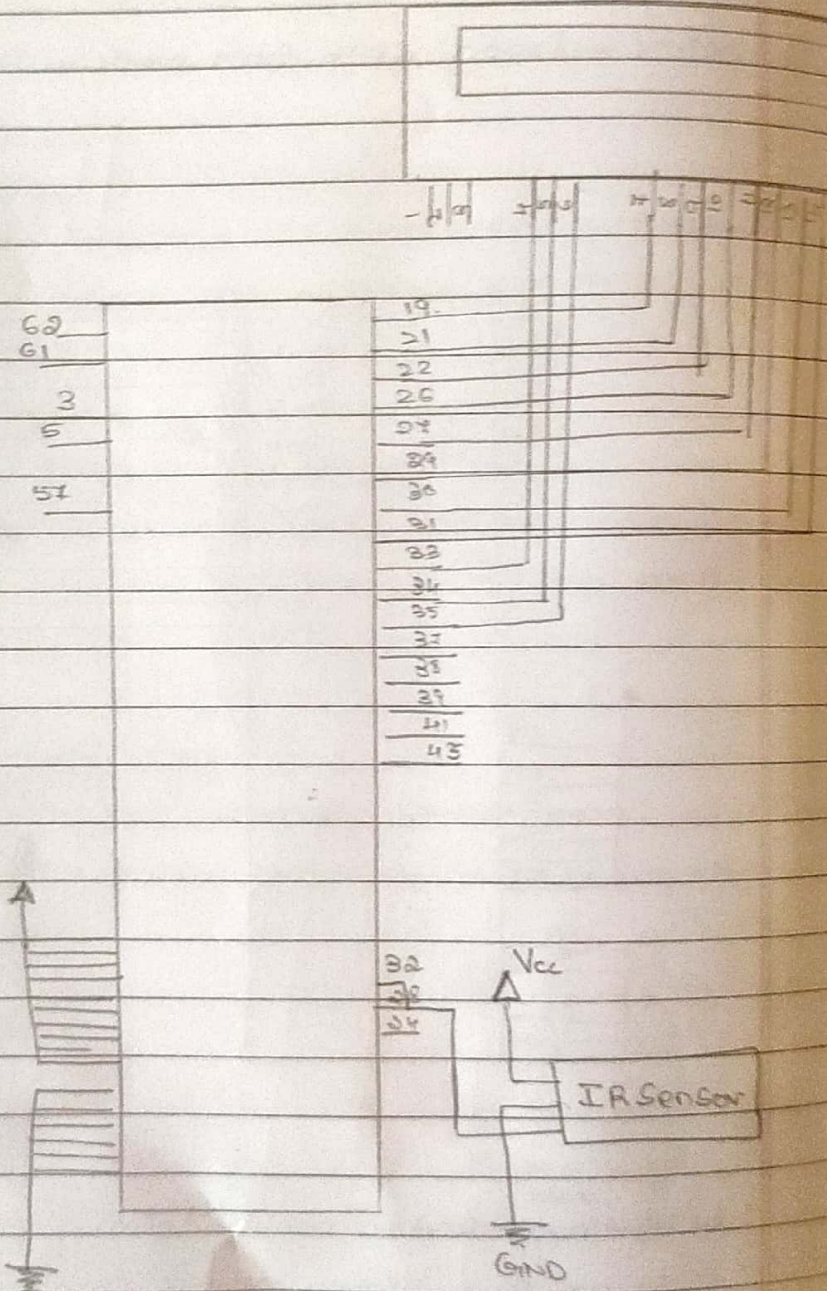
- In 4-bit mode, data is sent in nibble form.
- First we send higher nibble and then lower nibble with same.
- RS, RW and EN pin functioning as we were doing. In 4-bit mode.
- To enable the 4-bit mode of LCD, we need to follow



Special Sequence of initialization that tells the LCD Controller that user has selected 16x2 mode.

- LCD can be configured in 16x2 mode by sending appropriate command which is called Initialization.

# 10. IR Sensor working and interface with LPC1114





- An IR Sensor consists of IR LED & IR Photodiode. Together they are called as Photo Coupler.
- An Infrared Obstacle Sensor has built in IR Transmitter and IR Receiver.
- An Infrared Transmitter is light emitting diode.
- Infrared receivers are also called as infrared sensor as they detect Radiation from IR Transmitter.
- In above diagram,  $V_{cc} = 5V$ , Gnd - ground, Out - P1.24.
- LCD Connected to LPC1114,  
RS - P0.8, RW - P0.9, E - P0.10 Dataline P0.0-P0.7

#### 4. Types of LED. Interfacing of Single LED with LPC1114

↳ miniac use:

Mostly single LED's either are available in various shapes & sizes - from 2mm to 8mm through holes & surface mount packages. And the current rating ranging between 1mA to above 20mA. The multiple LED die are attached to flexible bonding tape from an LED light.

#### 2. AC Drivers:

These are LED's developed by semiconductor. It can be operated on AC power without DC converter. For each light cycle, the LED's emit light which is dark. And this is reversed during next half cycle.

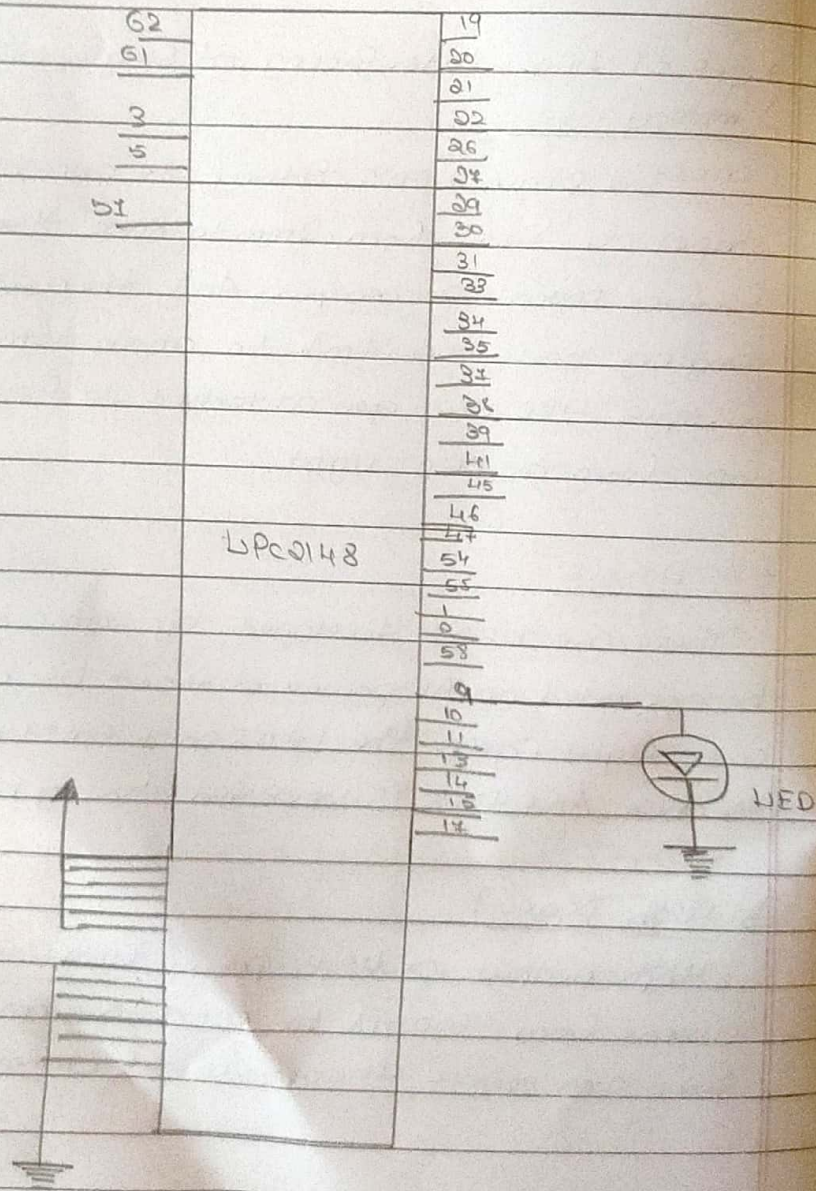
#### 3. High Power:

High output or high power LED's can be at current from 100mA to more than 1Amp. Some can emit thousands of lumens.



## Interfacing LED with LPC1114

- It works by turning ON an LED then turning it off then looping back to start.
- Operating Speed of microcontroller is very high so the flashing frequency will be very fast to detect for human.
- In LPC1114, there are 8 number of general LEDs connected with I/O port lines (P1.16 - P1.23) make port pin high.





5 Different types of Switch. Interfacing of Switch with LPC1114.

### 1. Unmanaged Switch:

These are switches that are normally used in home network and small business as they plug in and instantly start doing job. Each switch does not need to be watched or configured.

### 2. Managed Switch:

These switches have many features like highest level of security, precision control & full management of the network.

### 3. WAN Switch:

Also known as Ethernet switch or data switches. and are used to reduce network congestion or bottleneck by determining a package of data only to pass intended recipient.

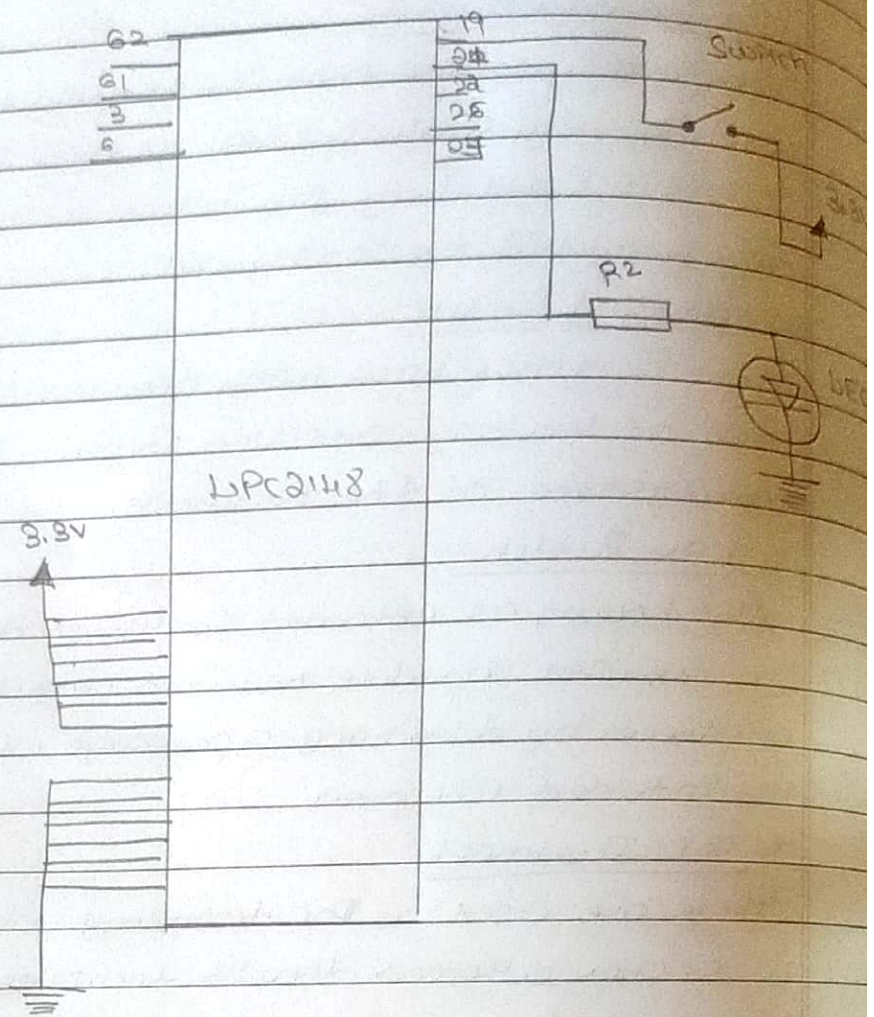
### 4. PoE Switches:

These are used in PoE technology which stands for power over ethernet that is technology that integrates data & power delivery to receiver data in parallel to power.

## Interfacing Switch with LPC1114

- Controlling LED by using switches in LPC1114 board.
- It works by turning on LED when joining it OFF when switch is going to low or high.
- LPC1114 Board has number of pins. LED's connected with V<sub>cc</sub> port lines to make port pin high.
- In below diagram, switch connected b/w LPC1114 and LED.





3. LPC2148 GPIO programming registers involved.
- GPIO function is most frequently used functionality of microcontroller.
  - The GPIO function in both the Ports are controlled by 4 Registers IOPIN, IODIR, IOSET, IOCLR.
  - IOPIN:
    - GPIO Port pin value register and can be used to read/write values directly to the PIN.
    - The Status of the PINS that are configured as GPIO can always be read from its register irrespective of direction set on Pin.



Syntax for IOPIN is,  $IOxPIN$  where  $x$  is Port 0 / Port 1

### IODIR:

GPIO Port Direction Control Register is used to set direction i.e. input or output of individual pins. when bit in this register is set to '0' corresponding pin in microcontroller configured as input. when bit set as '1' then configured as output.

Syntax:  $IOxDIR$ ,  $x$  for Port 0 / Port 1

### IOSET:

- GPIO Port Output Set Register is used to set the value of GPIO pin that is configured as output to high.
- when bit in the IOSET Register is 1 then logic 1.
- Setting '0' in this register has no effect on Pin.

### IOCLR:

- It is GPIO Port Output Clear register & can be used to set value of GPIO pin that is configured as output to low.
- when bit is '1' corresponding pin set to logic 0 & clears the IOSET register.
- Setting '0' to IOCLR Register has no effect on Pin.