

MBed Lab

Lab 1 →

Embedded System :-

{ computers processors
computers memory
i/o peripheral devices

Applications :-

consumer
industrial
automotive
home appliances
medical
telecommunications
commercial
military

(1768)

MBed Board specifications :-

32 bit ARM Cortex-M3 running at
96 MHz

812 kB Flash,
(without power) 32 kB RAM

built in ethernet,
USB host and Device

CAN ADC
SPI DAC
I2C PWM
I/O interfaces

40 pins

[p-5 p-30] for use

[p-15 - p-20] Analog IN

[p-18] Analog out

[p-21 - p-26] Power Out

Lab-2! [p-5 - p-20, p-21 - p-30] Digital pins.

.bin file is generated

{ wait
wait = ms

⇒

4 led

{ LED1
LED2
LED3
LED4

Digital Out Interface:- (1768)

p-5 - p-30

26 pins can be
used as digital input/output
pins

⇒ BUSOUT Interfacing

- to combine a number of Digital Out Interfacing
- upto 16 pins in a Bus
- any numbered pins (~~p0~~ - p-30)

⇒

Lab 37

Interrupt In Interfacing (triggers an event when digital pin change)
rising edge (0 → 1)
falling edge (1 → 0)

⇒ Ticker Object → for recurring object to repeatedly call a function at a specified rate
function can be static or member function

⇒ Timeout → call after a specified delay
attach and detach

1:32

- InterruptIn pin (p5)
- pin.rise (8 change)
- pin.fall (8 change)

tticker tt;
tt:attach(8day, 2.0)

Timeout to;
to:attach(8day, 2.0)

Lab 4:

AnalogIn \rightarrow read an external voltage applied to
an analog input pin.

value is a floating point 0.0 to 1.0

SV system / applied voltage 2.5V

AnalogIn read 0.5

AnalogIn read an external voltage applied to
analog in fraction of system voltage

p15-p10

p15 (pulse with modulation) \Rightarrow Analog Out

analog potentiometer \Rightarrow

AnalogIn p(p15)

p-read (1):

pinwOut led (65)

Lab 1

Lab 6 → Arduino Uno

ATmega328 Microcontroller

ICSP pin

RESET

3.3

5

GND

V_{in}



{ Crystal Oscillator
Voltage Regulator

AO - AS → Analog pins

Crystal oscillator present in Arduino Uno with 16MHz frequency

28 Input/Output pins, { 6 PWM pins, 6 analog pins
8 digital I/O pins

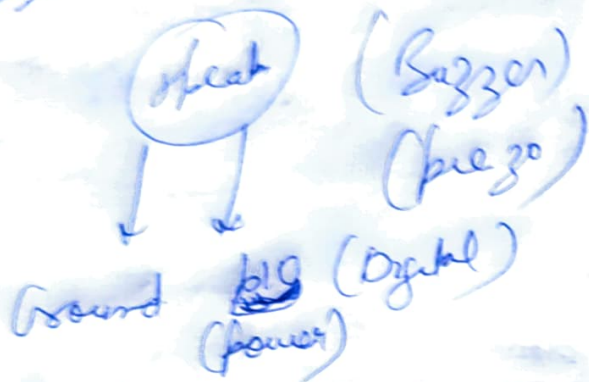
Input voltage varies from 7V to 20V

setup → once (initialization)

loop

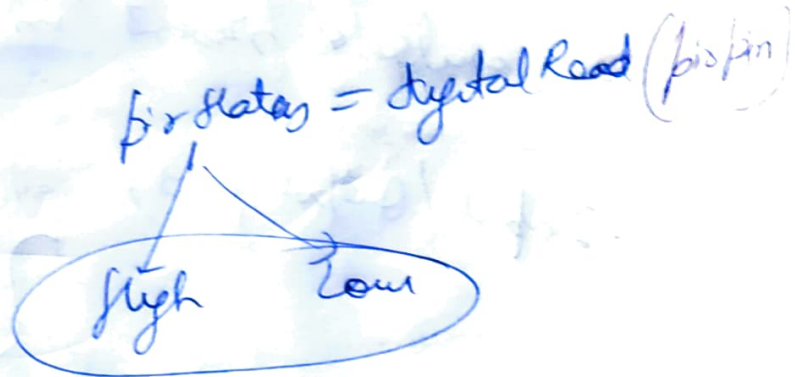
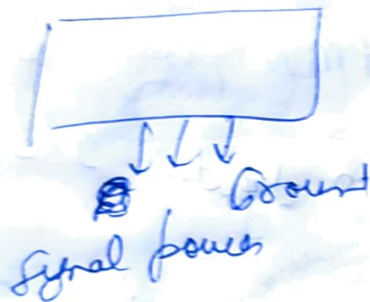
Lab-7! →

(detect object) → Passive Infrared sensor
Give accurate object (distance) → Ultrasonic sensor
→ DC Motors



duration frequency

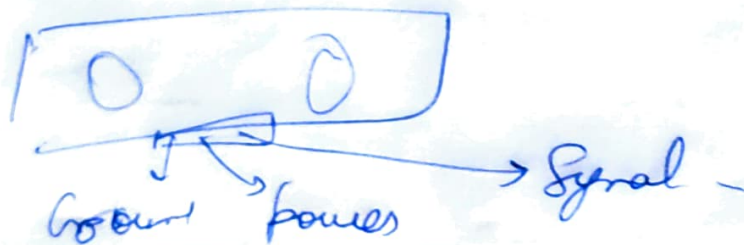
⇒ PIR sensor :-



If some object is moving



Ultrasonic sensor :-

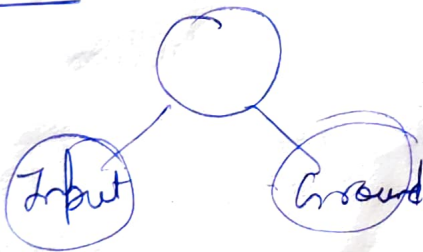


pin = ?

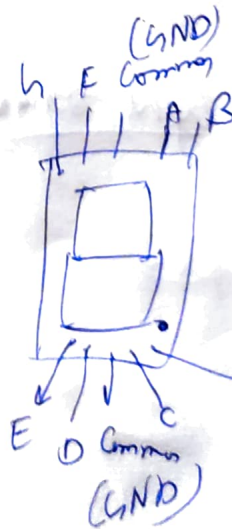
```
pinMode(pin, OUTPUT)
digitalWrite(pin, LOW)
delay(Microseconds)
digitalWrite(pin, HIGH)
```

```
pinMode(pin, INPUT)
duration = pulseIn(pin, HIGH)
{
  inches = microToInches(duration)
  cm = microToCentimeters(duration)
}
```

→ DC Motor



Lab 8 → 7 segment display



- push button
- speaker
- truck horn
- PIR
- US
- DC Motor
- 7 seg
- LED
- light bulb
- buzzer
- 7 MP
- Ambient light sensor
- Force
- keypad
- 7-seg

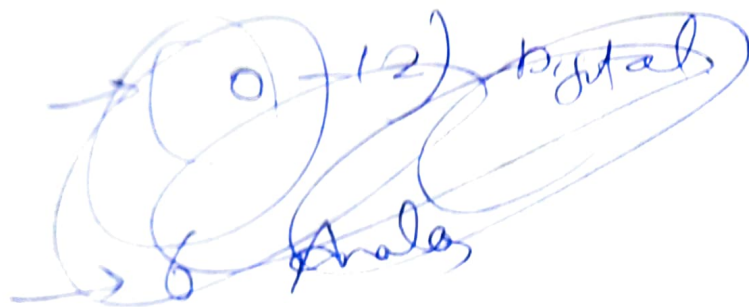
Validation Specifications

→ Linux operating system

→ 400 MHz

→ 256 MB of DDR3 RAM

→ 8 MB flash.



20 digital

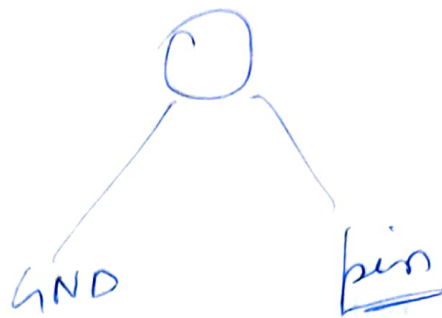
6 analog

6 PMUs

→ 1 core 32 bit Intel Pentium processor

→ 7V - 15V

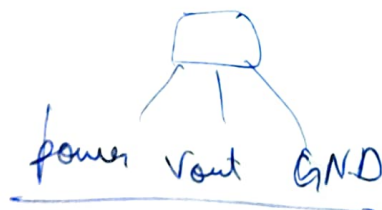
⇒ Light Bulb



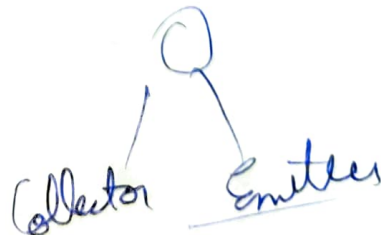
⇒ has sensor



TMDFerr

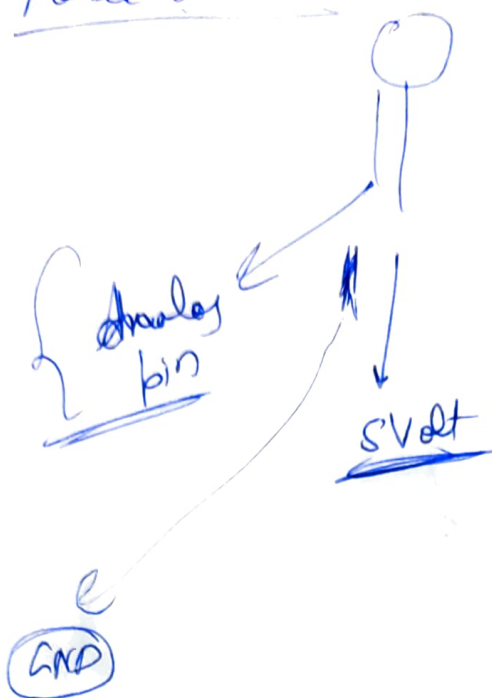


Ambient light sensor ⇒



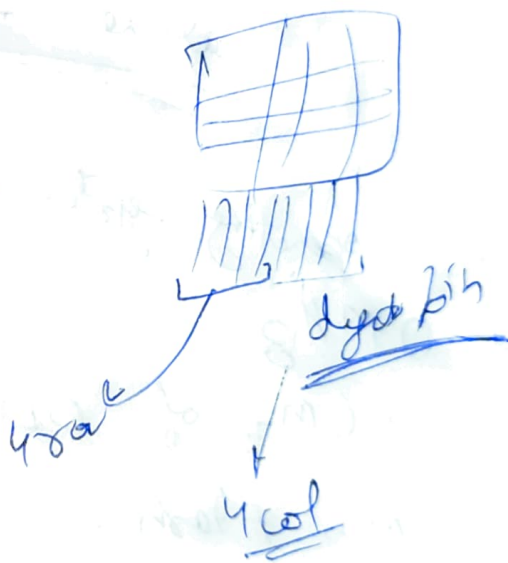
Lab-9

Force sensor:



Keyboard

8 wire



Tilt sensor

Digital Out

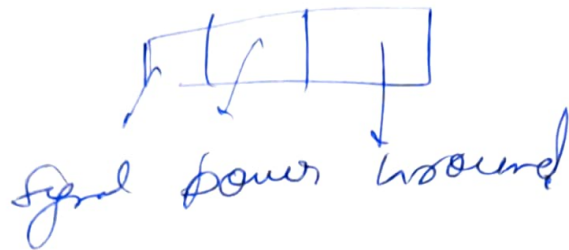


LCD

16 pins

Jedars \Rightarrow 6 pins

Some:



Qualities specifications

→ Linux operating system

→ 400 MHz

→ 256 Mb of DDR3 RAM

→ 8 Mb Flash.

→ (0-12) digital
→ 6 Analogs

{ 20 digital
6 analogs
6 PWMs

→ 1 core 32 bit Intel Pentium processor

→ 7V-15V