Lab Manual for Embedded System Design

Lab No. 12

Introduction to Raspberry Pi and Python Language

Objectives

Familiarize yourself with Raspberry-Pi and its developing environment. Familiarize yourself with Python Language Programming.

LAB # 12
Introduction to Raspberry Pi and Python Language

Introduction

Raspberry-Pi:

The Raspberry-Pi is an ARM powered credit card computer developed by the Raspbian-Pi Foundation for educational and hobbyist purposes.

The Raspberry Pi 3 Model B features a quad-core 64-bit ARM Cortex A53 clocked at 1.2 GHz. It has a Broadcom BCM2837 system on a chip (SoC). It has 4 USB ports. It has 1 GB memory. The feature of the Pi 3 is the built-in WiFi and Bluetooth. It uses an SD card for booting and persistent storage. Figure 1 shows Raspberry-Pi peripheral details.

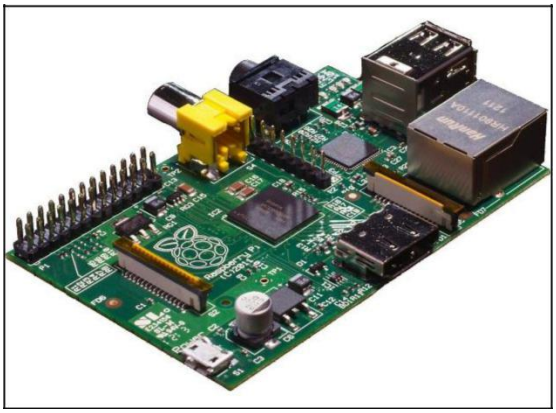

Figure 1: Raspberry – Pi Board B

Raspberry-Pi Operating System:

Raspbian is a free operating system based on Debian Optimized for the Raspberry-Pi Hardware. It is precompiled with sets of basic programs that make your Raspberry-Pi run. However, Raspbian provides more than a pure OS. It cones over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry-Pi.

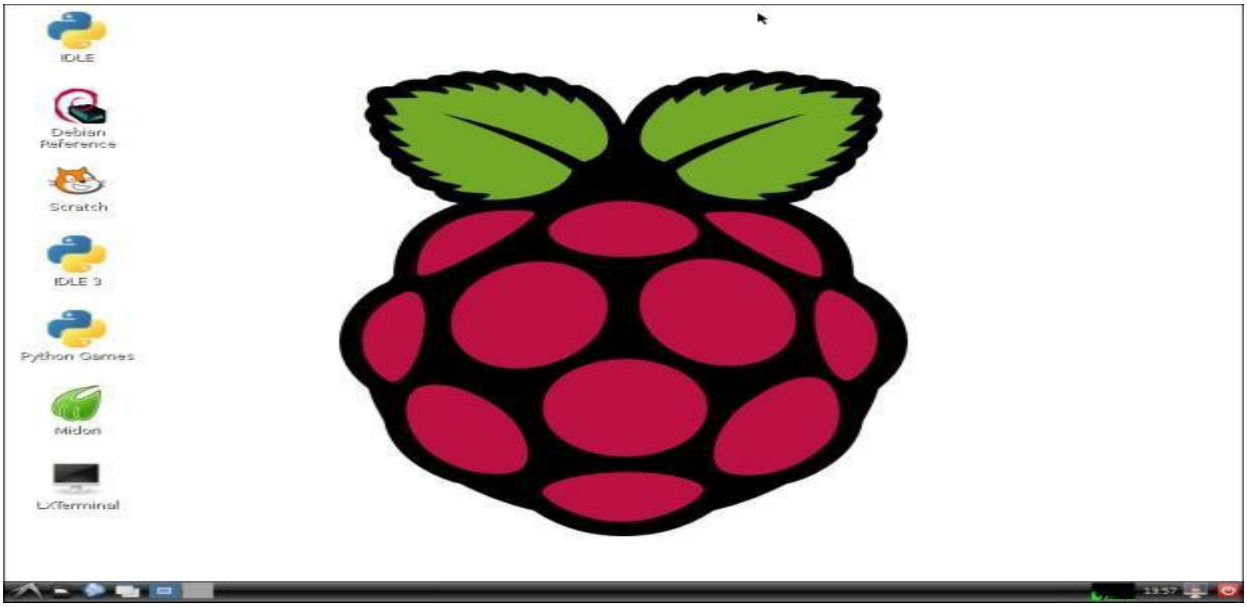

Figure 2: Raspbian Desktop

Programming with Python:

Python is a widely used general-purpose, high-level programming language. Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines

of code than would be possible in languages such as C++ or Java. Python is a wonderful and powerful programming language that's easy to use (easy to read and write) and with Raspberry Pi lets you connect your project to the real world. Python syntax is very clean, with an emphasis on readability and uses standard English keywords. Start by opening IDLE from the desktop.

The easiest introduction to Python is through IDLE, a Python development environment.

Figure 3: IDLE Python GUI

Time Boxing

Activity Name	Activity Time	Total Time
Login Systems + Setting up Raspberry PI Environment	3 mints + 5 mints	8 mints
Walk through Theory & Tasks	60 mints	60 mints
Implement Tasks	80 mints	80 mints
Evaluation Time	30 mints	30 mints
	Total Duration	178 mints

Objectives

To Study the SOP Implementation with Multiplexer. To Study the Full Adder Design using Multiplexer. To Study the Basic ALU Design using Multiplexer.

Lab Tasks/Practical Work

1. In this task we will write a simple Python script in IDLE to calculate the Percentage by taking the Marks of the courses as input.

```
print "Welcome to Bahria University (Karachi Campus)"

a = input ("Enter Marks Obtained in the Course of E.N.A: ")

b = input ("Enter Marks Obtained in the Course of SIGNALS AND SYSTEMS: ")

c = input ("Enter Marks Obtained in the Course of COMPUTER ARCHITECTURE: ")
total_marks = a+b+c

print "Total Marks Obtained are: ", total_marks
percentage = float(total_marks) * (100 / 300)
print "Percentage is: ", percentage
```

2. In this task we will write a simple Python script to check that the input number is either even or odd.

```
a = input ("Enter Number: ")

if (a == 0):

    print "Entered Number is Zero."

elif (a % 2 == 0):

    print "Entered Number is Even."

else:

    Print "Entered Number is Odd."
```

3. Write Python Script for Calculator which can perform simple operations of Addition, Subtraction, Multiplication and Division.

4. Write ten main Raspberry-Pi application projects. Briefly discuss their details.