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MATRIC NO: 18/ENG05/002

DEPARTMENT: MECHATRONICS ENGINEERING

COURSE TITLE: STRUCTURED COMPUTER PROGRAMMING

COURSE CODE: ENG224

ASSIGNMENT: AUTOMATED IRRIGATION SYSTEM SOFTWARE DEVELOPMENT

DATE: 16th MAY 2020

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Assignment:

An automated irrigation System Software Application Development Cycle

① The Application Concept

The steady supply of water to plants is very essential for plant growth and productivity. Water helps in dissolving needed by plants and in regulation of ~~plants~~ temperature for the healthy living of the plants. A way to ensure timely supply of water to the plants on the farm is through irrigation.

Irrigation is the application of regulated amounts of water to plants at needed intervals. It is very labour intensive to operate an irrigation system manually. Therefore, automation of an irrigation system with a compatible and efficient Software will be of great help on the farm.

The software which will be working with various circuits and other hardware components is expected to be able to read soil temperature, determine soil moisture content, configure time interval for the water system

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trigger an alarm in case of insufficient water in tanks, enable password for the ~~syster~~ system.

~~Application/software specifications.~~

The main specification for this software is for it to be able to;

1. Read soil temperature
2. Determine soil moisture content
3. Configure time interval for the water system.
4. Trigger an alarm in case of insufficient water in tanks
5. Enable password lock for the system

(1) Read soil temperature.
The sub-tasks include:

a. Integrating a soil thermometer and sensor into the hardware component.
b. Writing a C program into the microcontroller that will be read the signal sent from the ADC (Analog-Digital Converter).
c. Writing preset normal temperatures for the farm sections.
d. The ADC (Analog-Digital converter to convert the analog signal from the soil temperature sensor.

(2) Determine soil moisture content

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The sub tasks will include:

(a) Integrating a soil moisture sensor into the hardware component of the automated system.

(b) Supplying power to the soil moisture sensor.

(c) Integrating an Analog - Digital converter to read the analog signal from the sensor and convert it to digital signal for the microcontroller.

(d) Writing a preset normal moisture content program into the microcontroller.

(e) Send the received signal to the Farmer's mobile using GSM (Global System for Mobile Communication) as text messages or through E-mail.

(3) Configure time interval for the water system.

The sub-tasks will include:

(a) A programmed timer or irrigation time clock with preset time for ON/OFF of the irrigation system

(b) Connecting the program timer to a port on the microcontroller.

(c) Preset time calculated according to volume of water (litres/day) and average flow rate (litres/hour).

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insufficient water in tanks.

The subtasks will include:

(a) Having a water level sensor in all water supply tanks.

(b) Writing a C program indicating the normal volume of water for the tanks.

(c) Putting the C program into the microcontroller.

(d) System shutdown automatically when the microcontroller receives a low level of water signal from the sensor with an Op-amp (operational amplifier) serving as a interface between the sensing device and the micro-controller.

(e) Sending the signal to the farmer's (f) mobile using GSM.

(5) Enable password lock for the system.

The subtasks will include

(a) Integrating a programmable lock system into the hardware component.

(b) Writing a C program to enable input an save of a password on the system.

(c) Connecting the lock system to the microcontroller which actuates the motor that drives the water pump.

Application Design

This involves a precise algor-

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ithm and flow chart that will be very feasible and efficient for the functionality of the software and the automated system

ALGORITHM.

* Start
* Connect automated system to farmer's mobile ~~via~~ through GSM, BLUETOOTH, or WIFI
* Enable Developed mobile Application and input password
* Activate soil thermometer/sensor.
* If temperature signal received is greater than normal temperature in C program.
* ~~Activate water level sensor~~
* ~~If wat~~
* Activate soil moisture content sensor
* If soil moisture content data received is lower than normal moisture content in written C program
* Activate water level sensor
* If water level data in tanks received is considered to be okay according to the normal volume written in C program.
* Send all signals to farmer's mobile through GSM text or EMAIL.
* Pump ON / valve open
* END

Flow Chart.

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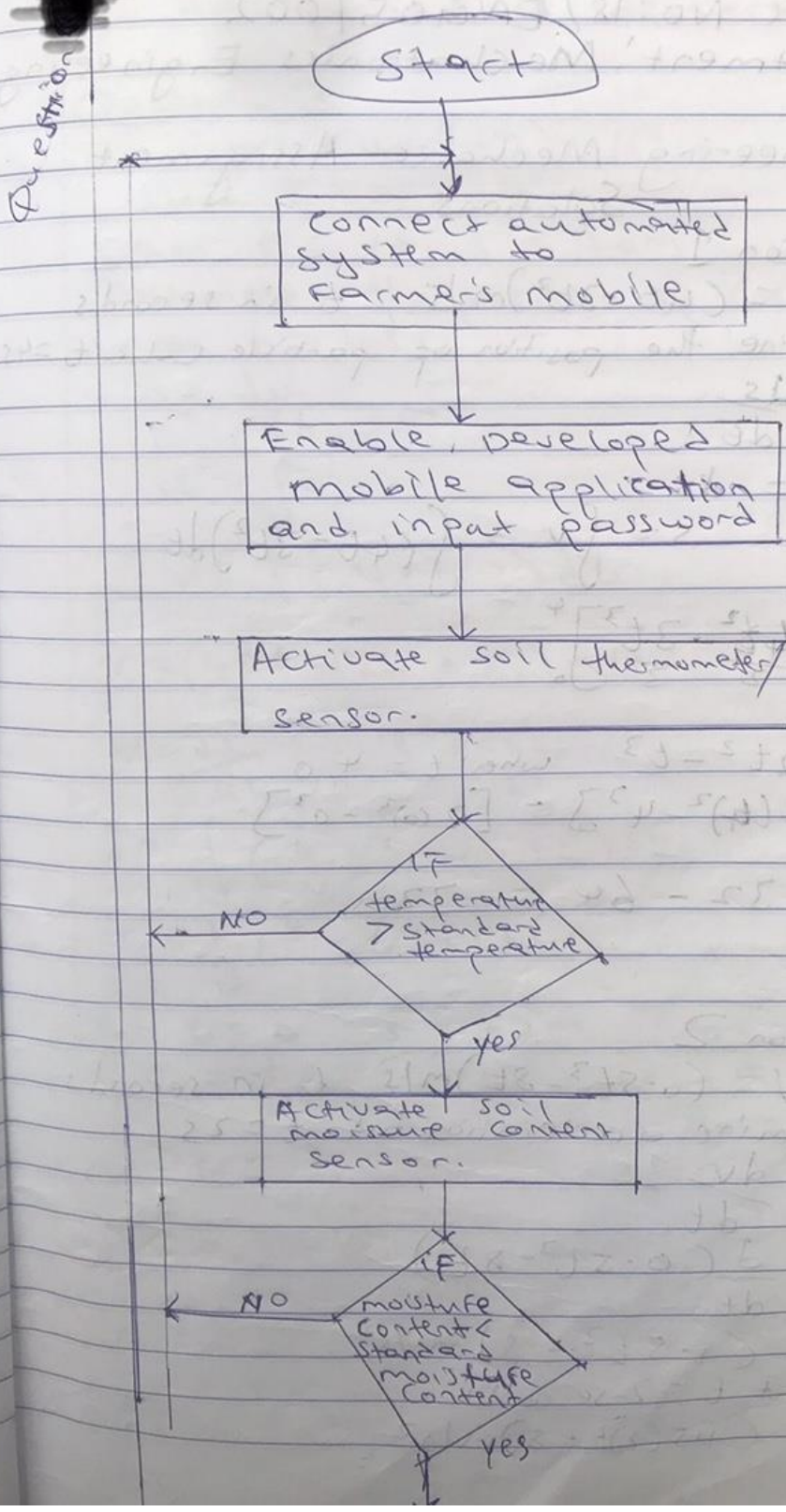
Question

Flow Chart.



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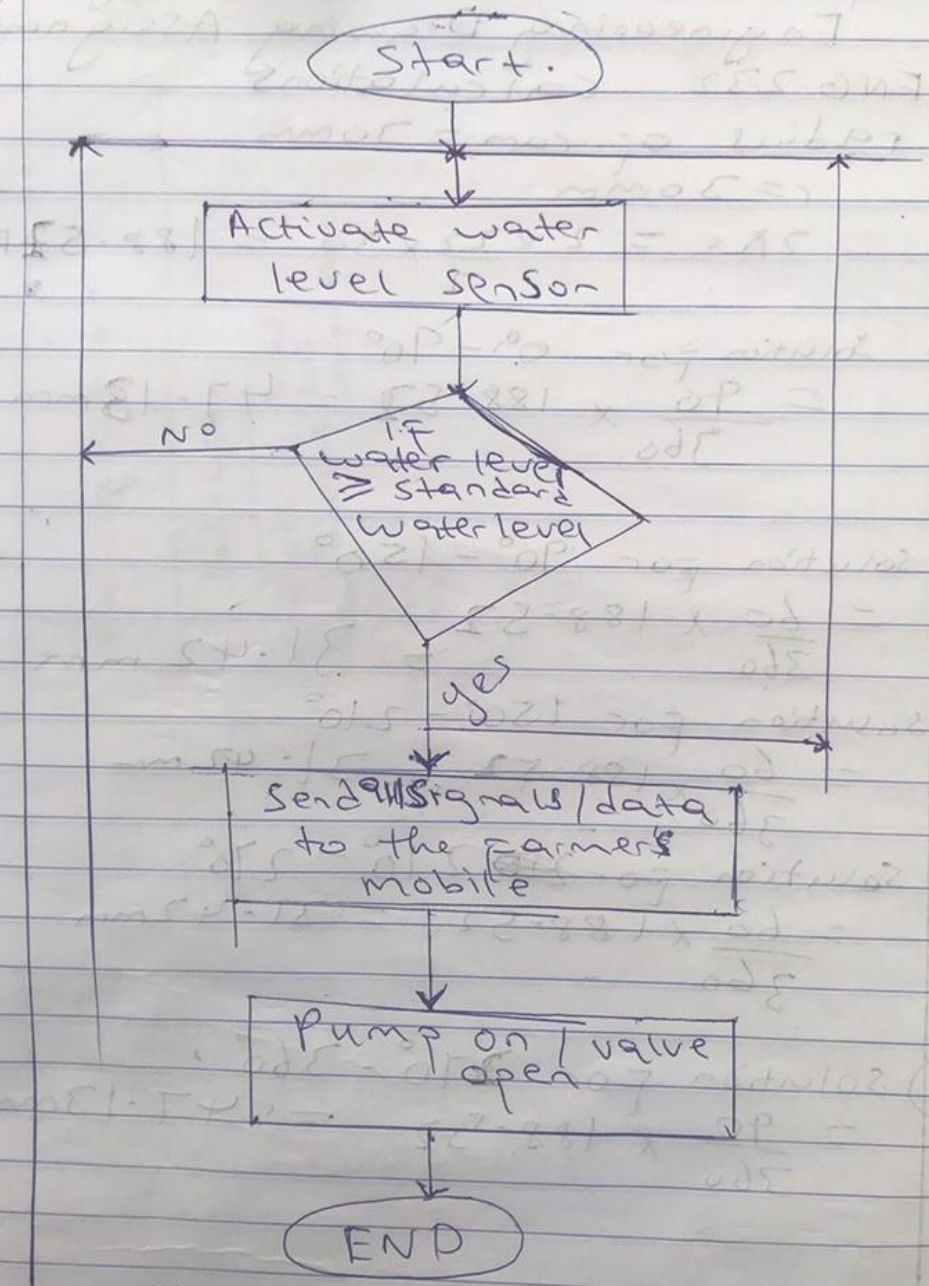
Flow Chart Conversation

Question



Software Development Flow chart.

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IMPLEMENTATION.

The automated irrigation system software will be developed using C program and visual basic program. The use of C program and visual basic program makes it possible to compare the value of the soil temperature and moisture content by the carbon probe with the standard value which has been written into the program.

The C program written will be saved in hex file. The program will contain predetermined values which will serve as standard values for soil temperature, soil moisture content, water level as well as the ON/OFF actuation instruction for the water pump. The program will also contain instruction to send signal and initiate an alarm in case of insufficient water in tanks.

The hex file which contains the C program will be put into the micro controller using Flash magic Software. Flash magic Software. An LCD (Liquid Crystal Display) interfaced with the micro controller will be able to display soil status and water pump on/off condition. The output signal of the micro controller will serve as input to the soft-

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Software. The output of the software from already developed instructions will serve as input back to the microcontroller and will determine if the relays should be actuated to drive the water pump motor.

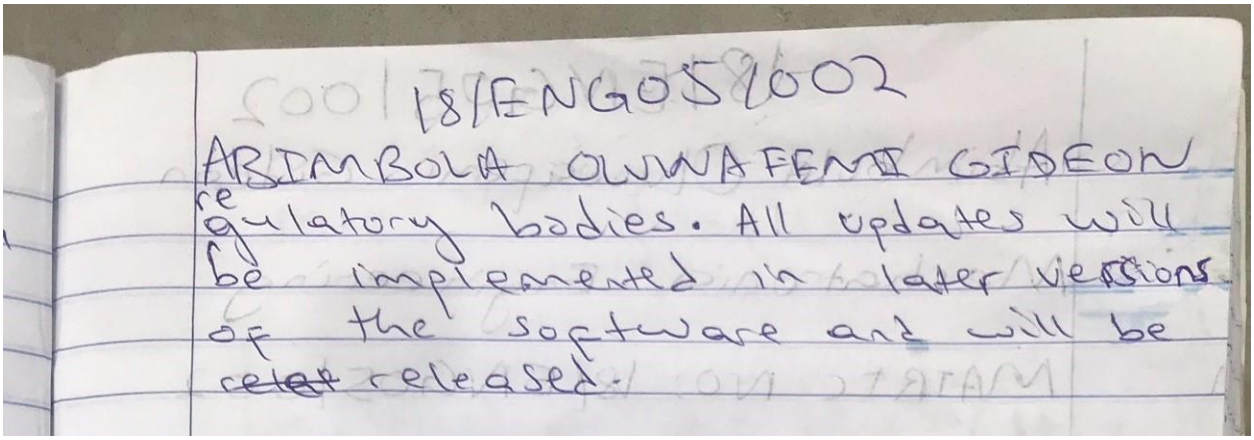
Testing and Debugging

Errors may occur during the operation of the automated system and such errors can be detected during testing. A test will be carried out to analyze the interfacing of the carbon probe and the soil thermometer and sensor with the C program to trigger the relay which triggers the motor pump to pump water to the soil. Carbon probe electrical resistance is used to determine soil moisture content.

Any errors detected during test will go through the debugging process, After which all components of the automated system will be confirmed to be in good condition and functional.

Release and update.

The Software will be released to the public for use after acceptance by necessary re-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regulatory bodies. All updates will be implemented in later versions of the software and will be ~~relet~~ released.

QUESTION B

Question

Software features.

The software program will be written in C programming language and visual basic. C program is an object-oriented program. The C program will be saved in hex file. The hex file will be put in the microcontroller using flash magic software. Flash magic software is a personal computer tool for programming flash based controllers using a serial or ethernet protocol while in the target hardware. A mobile can be developed as a software that will be able to communicate with the controller via WIFI connection. A dashboard on the software can be used to view information about water usage, scheduled runs, etc.

Hardware features.

1. A 5 volts DC supply circuit Design

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The AC (Alternating current) voltage typically 220v/240v is connected to a transformer which steps the AC voltage to the desired DC (Direct current) output. A diode rectifier provides a full wave rectified voltage which is initially filtered by a capacitor to produce DC voltage. A voltage regulator helps to remove the ripples in the resulting DC voltage while maintaining its value. A typical example of a voltage regulator is the zener diode. The 5volts DC power supply is required by all electronics involved in the automation process.

(2) Soil temperature and soil moisture content sensors

These sensors are buried in the ground near the roots of the plant. They are able to sense soil temperature and moisture content and send it to the micro controller through an analog to digital converter and an operational amplifier.

(3) ADC (Analog to Digital Converter)

This component is used to convert the analog data received from the sensing devices to digital data so that it can be processed by the microcontroller.

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(4) OP-amp (Operational amplifier).
This component serves as a comparator interface between the micro controller and the sensing devices. It is also involved in amplification.

(5) LCD (liquid Crystal Display).
This component is interfaced with the micro controller to display soil status and water pump on/off condition.

(6) Relays
This component drives the motor to pump water to the soil

(7) Micro controller.
This is a major component of the automated system. It contains the program that determines the on/off of the pumps. it also helps in the communication between the software and hardware components. The micro controller drives the relays which drives the pump to supply water to the soil.

QUESTION C

ALGORITHM.

* Start
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* Enable Developed mobile Application and input password
* Activate Soil thermometer/sensor.
* If temperature signal received is greater than normal temperature in C program.
* ~~Activate water level sensor~~
* ~~If wet~~
* Activate soil moisture content sensor
* If soil moisture content data received is lower than normal moisture content in written C program
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* If water level data in tanks received is considered to be okay according to the normal volume written in C program.
* Send all signals to farmer's mobile through GSM text or EMAIL.
* Pump ON / valve open
* END

Flow Chart.

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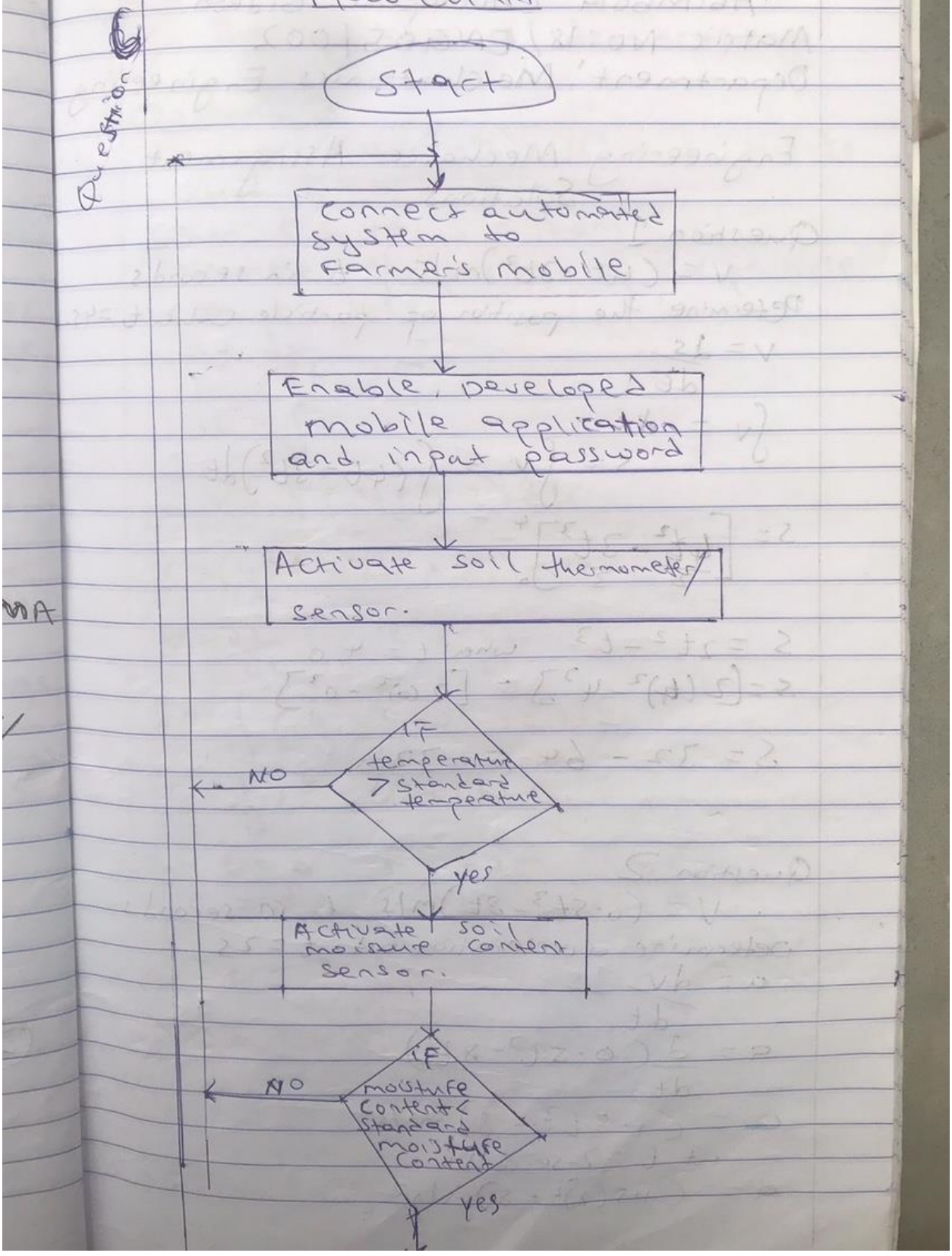
Flow Chart.



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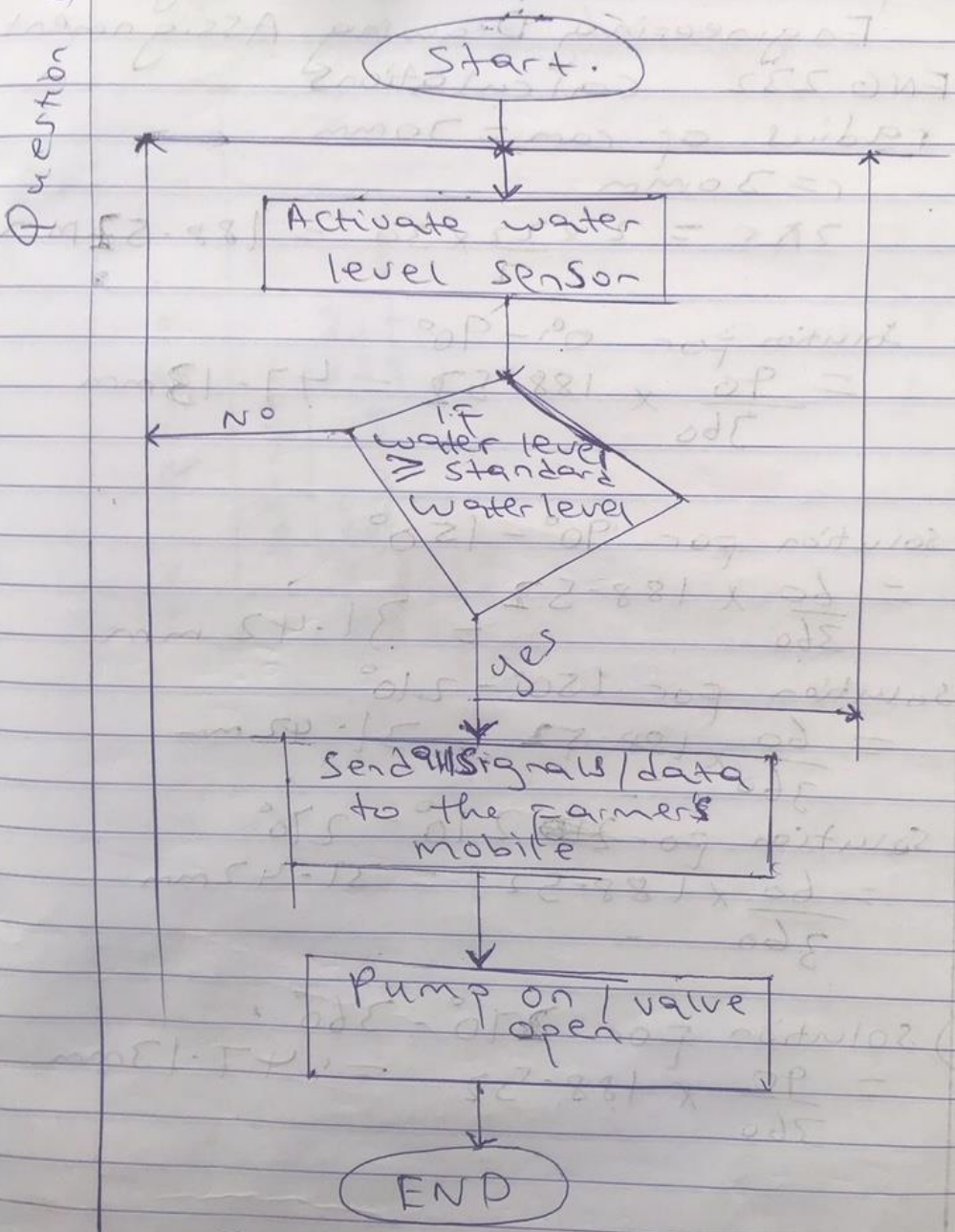
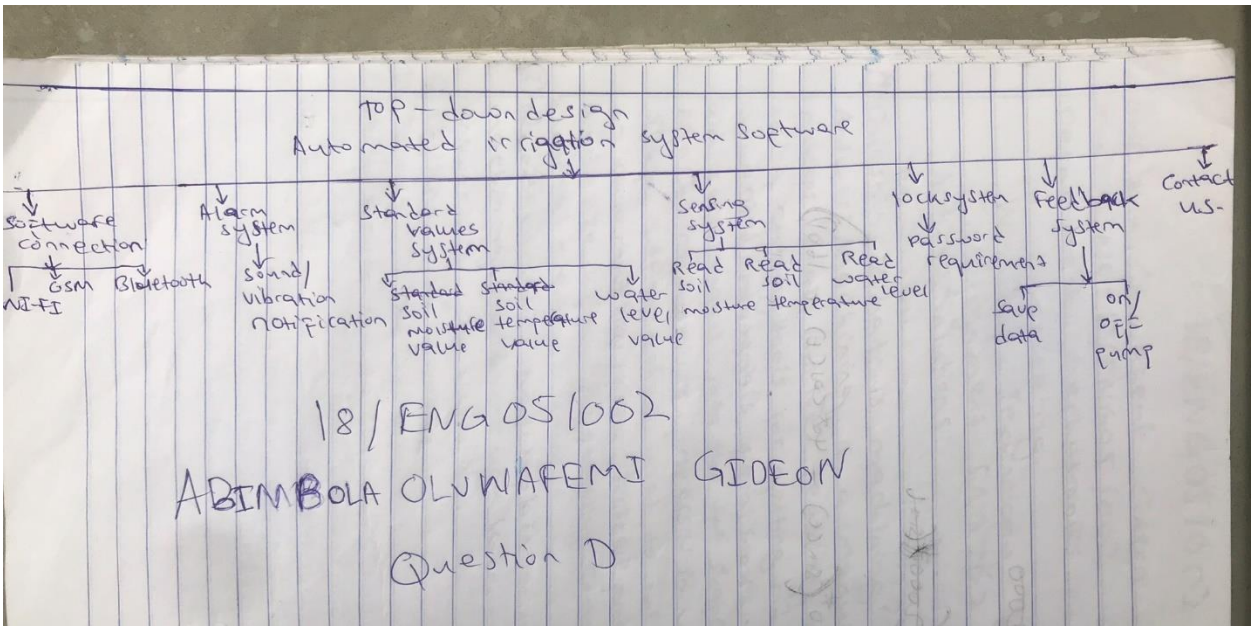
Flow Chart Continuation

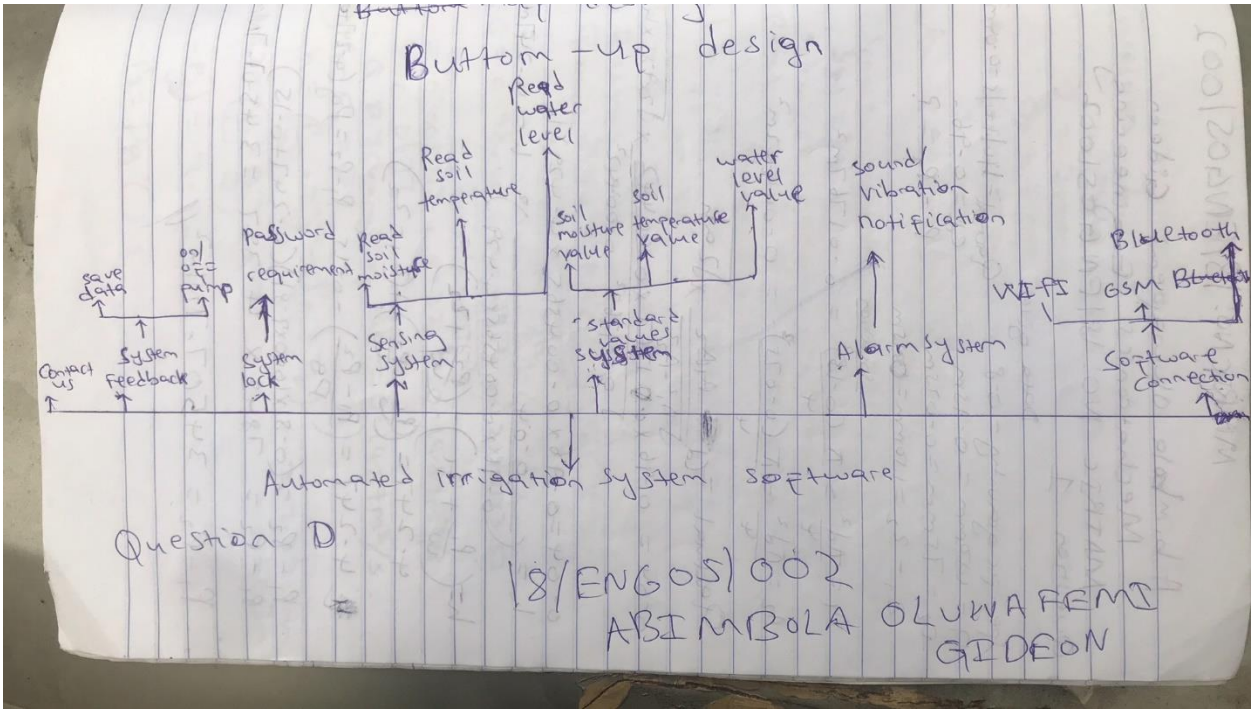
Question 6



Software Development Flow chart.

QUESTION D





CONCLUSION

Conclusion.

This software will be of great help in the automation of the farm irrigation system. The automation of such system will help to increase farm productivity conserve water, Reduced cost of production by reduced requirement for manual labour.