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MATRIC NO: 18/ENG09/006

DEPARTMENT: AERONAUTICAL ENGINEERING

COURSE: ENG224

TITLE: ASSIGNMENT

1. A

ASSIGNMENT

A) i.) ## CONCEPTUALIZATION

The software to be designed is an irrigation-based application software to automate and control Irrigation Machines in maintaining good soil for farming.

SPECIFICATION

⇒ Diagnosis system/ Soil scan system:

This System ascertains the amount or value of the major properties of the soil that affect the manner and method of irrigation. These properties in the context of the software design are Temperature and Moisture Content.

• Temperature Scan:

This technology makes use of an external measurable property such as Current, electrical resistance etc which is directly related to the soil temperature to measure it.

• Moisture Content Scan:

This technology also uses the same procedure above; to be specific, it uses the galvanic cell technology by measuring the amount of Voltage the soil generates by electrochemical processes where water is the electrolyte. Higher level of water means higher voltage and vice-versa.

⇒ Time Configuration System:

This system runs scans on the temperature and moisture content of soil or rather uses these results to configure a time interval for scanning the soil so as to determine the necessity of irrigation

and the amount of irrigation required.

⟹ Control and Alarm system:
This works hand-in-hand with the Time configuration system. From regular checks, the system displays the status of the soil and, if need be, opts to be granted access from an operator to trigger the irrigation system. However, in the case of a critical amount or level of temperature or moisture content it automates itself and triggers 'on' or 'off' by its discretion with a warning to indicate the situation.

⟹ Security System:
A necessity to operating any special or important application software. It uses a database to store and record the names and IDs of operators before engaging an authentication. The Authentication has two stages
• Fingerprint, Voice or facial authentication:
This authentication process compares the fingerprint, Voice or facial scans of the operator to the pre-entered scan peculiar to the operator's name and ID. Once any of the three features is authenticated, access is granted.
• Password or PIN:
This authentication process requests for a Password or PIN which has been pre-registered into the system. Unlike the first authentication process, the entered code that is to be accepted is not peculiar to any operator but is the same for each operator.
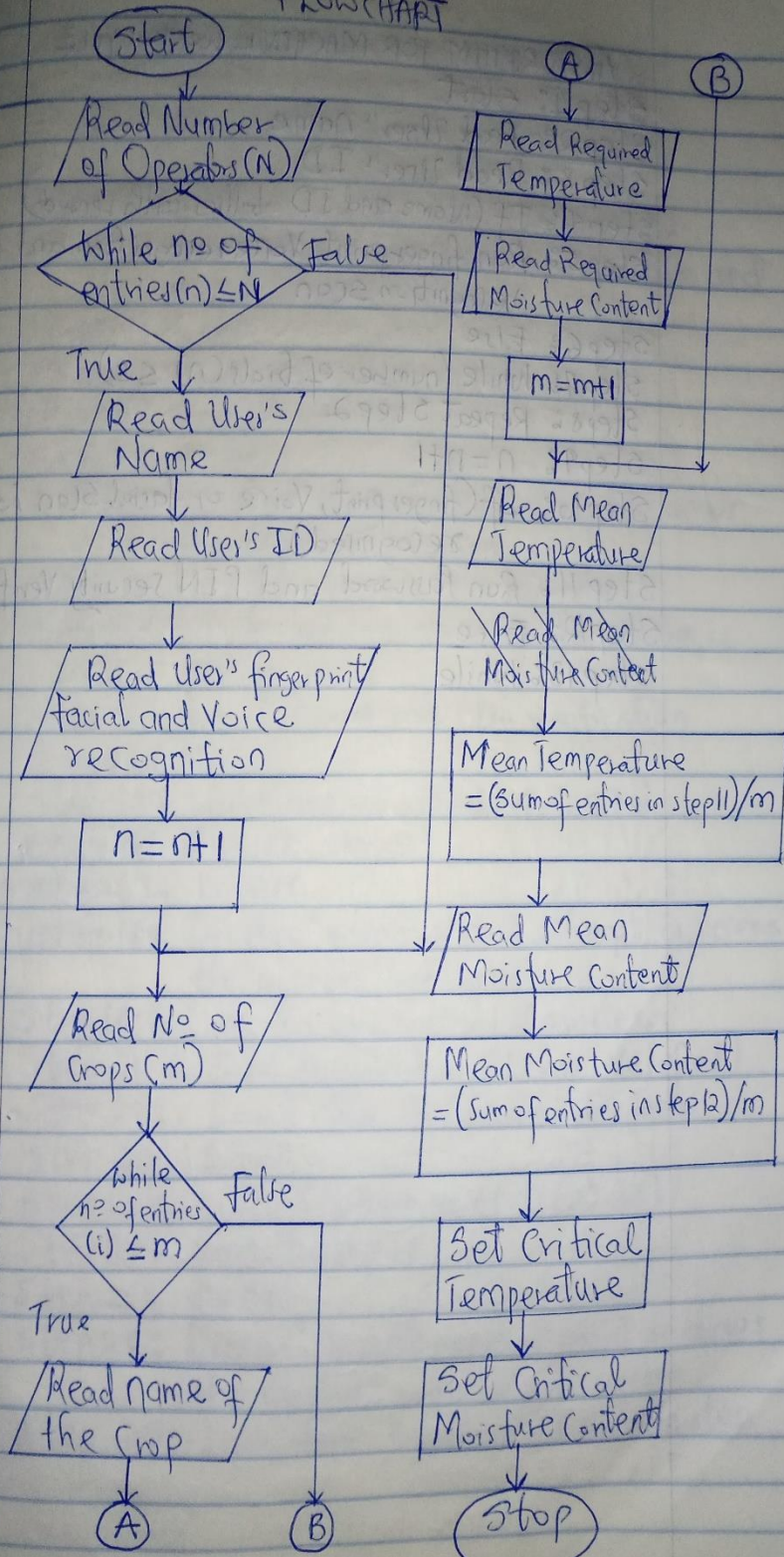
DESIGN

The Algorithm for the Software can be classified under two stages:

i) Algorithm for Software set-up
ii) Algorithm for Machine Working-Cycle

ALGORITHM FOR SOFTWARE SET-UP

Step 1: Start

Step 2: Read the number of Operators (N) permitted to operate the software

Step 3: while (number of entries (n) $\leq$ N)

Step 4: Read User's Name

Step 5: Read User's ID

Step 6: Read User's fingerprint, facial recognition and voice recognition

Step 7: $n = n+1$

Step 8: Read the number of crops to be planted (m)

Step 9: while ($i \leq m$)

Step 10: Read the name of the crop

Step 11: Read required temperature for crop growth

Step 12: Read required Moisture content for crop growth

Step 13: $m = m+1$

Step 14: Read Mean temperature

Step 15: Mean temperature = (Sum of entries in step 11) / m

Step 16: Read Mean moisture content

Step 17: Mean moisture content = (Sum of entries in step 11)/m

Step 18: Set critical temperature with respect to Mean temperature

Step 19: Set Critical Moisture content with respect to Mean moisture content

Step 20: Stop

FLOWCHART

Start

Read Number of Operators (N)

while no. of entries (n) ≤ N — False

True

Read User's Name

Read User's ID

Read User's finger print, facial and Voice recognition

$n = n+1$

Read No. of Crops (m)

while no. of entries (i) ≤ m — False

True

Read name of the Crop

A

B

A

Read Required Temperature

Read Required Moisture Content

$m = m+1$

Read Mean Temperature

Read Mean Moisture Content

Mean Temperature = (Sum of entries in step 11)/m

Read Mean Moisture Content

Mean Moisture Content = (Sum of entries in step 12)/m

Set Critical Temperature

Set Critical Moisture Content

Stop

B

ALGORITHM FOR MACHINE WORK-CYCLE

Step 1: Start

Step 2: Read User's Name

Step 3: Read User's ID

Step 4: If (Name and ID tallies with record)

Step 5: Run finger print, Voice recognition and facial recognition scan

Step 6: Else

Step 7: While (Number of trials (n) ≤ 3)

Step 8: Repeat Step 2

Step 9: $n = n+1$

Step 10: Display "Unauthorized attempt to access the System" warning

Step 11: Lock the System for 15 minutes

Step 12: If (fingerprint, Voice or facial scan is recognised)

Step 13: Run Password and PIN verification

Step 14: Else

Step 15: While (number of trials (n) ≤ 3)

Step 16: Repeat step 5

Step 17: $n = n+1$

Step 18: Display "unauthorized attempt to access the system" warning

Step 19: Lock the system for 15 minutes

Step 20: If (Password or PIN is verified)

Step 21: Load the software interface

Step 22: Else

Step 23: While (number of trials (n) ≤ 3)

Step 24: Repeat Step 13

Step 25: $n = n+1$

Step 26: Display "Unauthorized attempt to access the system" warning

Step 27: Lock the system for 15 minutes

Step 28: Run temperature scan on the soil
Step 29: If (temperature scan = Mean temperature)
Step 30: Display "Optimal temperature status" notification
Step 31: Else
Step 32: If (temperature scan < Mean temperature)
Step 33: Display "Low temperature" notification
Step 34: Else
Step 35: If (temperature scan > Mean temperature
Step 36: Display "High temperature" Warning
Step 37: If (temperature scan > Critical temperature)
Step 38: Display "Critical temperature exceeded"
        emergency alert
Step 39: Trigger Irrigation Machine
Step 40: Else
Step 41: Display "Trigger Irrigation Machine" Dialog
        box with Yes or No options
Step 42: If (response = Yes)
Step 43: Trigger Irrigation Machine
Step 44: Else
Step 45: Run Soil Moisture Content scan
Step 46: If (Moisture scan = Mean Moisture)
Step 47: Display "Optimal Moisture content"
Step 48: Else
Step 49: If (Moisture scan > Mean Moisture)
Step 50: Display "High Moisture Content" notification
Step 51: Else
Step 52: If (Moisture scan < Mean Moisture)
Step 53: Display "Low Moisture Content" notification
Step 54: If (Moisture scan < Critical Moisture Content)
Step 55: Display "Critical Moisture Content exceeded"
        emergency alert
Step 56: Trigger Irrigation Machine
Step 57: Else
Step 58: Display "Trigger Irrigation Machine" Dialog
        box with 'Yes' or 'No' options

Step 59: I
Step 60: Tr
Step 61: F
Step 62:
Step 63:

Step 59: If (response = Yes)
Step 60: Trigger Irrigation Machine
Step 61: Else
Step 62: Configure time for next automatic scan
Step 63: stop

FLOWCHART

Start

Read User's Name

Read User's ID

If Name & ID tally with record → Else

Run finger print, Voice and facial Scan

While n ≤ 3 → False

True

Repeat step 2

$n = n+1$

Display Unauthorised attempt to access System

Lock System for 15 minutes

Run Password and PIN Verification

A   **B**

A

If
Fingerprint,
facial or
voicescan
tallies → Else

Run Password
and PIN
Verification

While
n ≤ 3 → False

True

Repeat
step 5

n = n+1

Display "Unauthorised
attempt to access
the system

Lock the system
for 15 minutes

If
Password or
PIN is
correct → Else

Load
Software

A   B

B

C

(A) (B)   (C)

While
n≤3   False

True

Repeat
Step13

n=n+1

Display "unauthorised
attempt to access
the system"

Lock the system
for 15 minutes

Run temperature
scan on the soil

If
temperature   Else
scan = Mean
temperature

Display "Optimal   If
Status of soil   temperature
temperature"   scan < Mean
                        temperature

                        Display "Low
                        temperature notification"

(A)   (B)   (C)   (D)

(A) (B) (C) (D)

Display "High temperature" notification or warning

If temperature scan > critical temperature — Else

Display "Critical temperature exceeded" emergency alert

Display "Trigger Irrigation Machine dialog box with 'Yes' or 'No' options

Trigger Irrigation Machine

If response = Yes — Else

Trigger Irrigation Machine

Run Moisture Content Scan

If Moisture scan = Mean Moisture — Else

(A) (B) (C)

(D) (A) (B) (C)

(A) → Display "Optimal Soil Moisture Content"

(B) → If Moisture scan > Mean Moisture — Else

Display "High Moisture Content" Notification

Display "Low Moisture Content" Notification

(E)

If Moisture scan < Critical Moisture — Else

Display "Critical Moisture Content exceeded" emergency alert

Triggers Irrigation Machine

Display "Trigger Irrigation Machine" dialog box with 'Yes' or 'No' options

(A) (B) (C) (D)

(A) (B) (C) (D) (A) (E)

If response = Yes — Else

Trigger Irrigation Machine
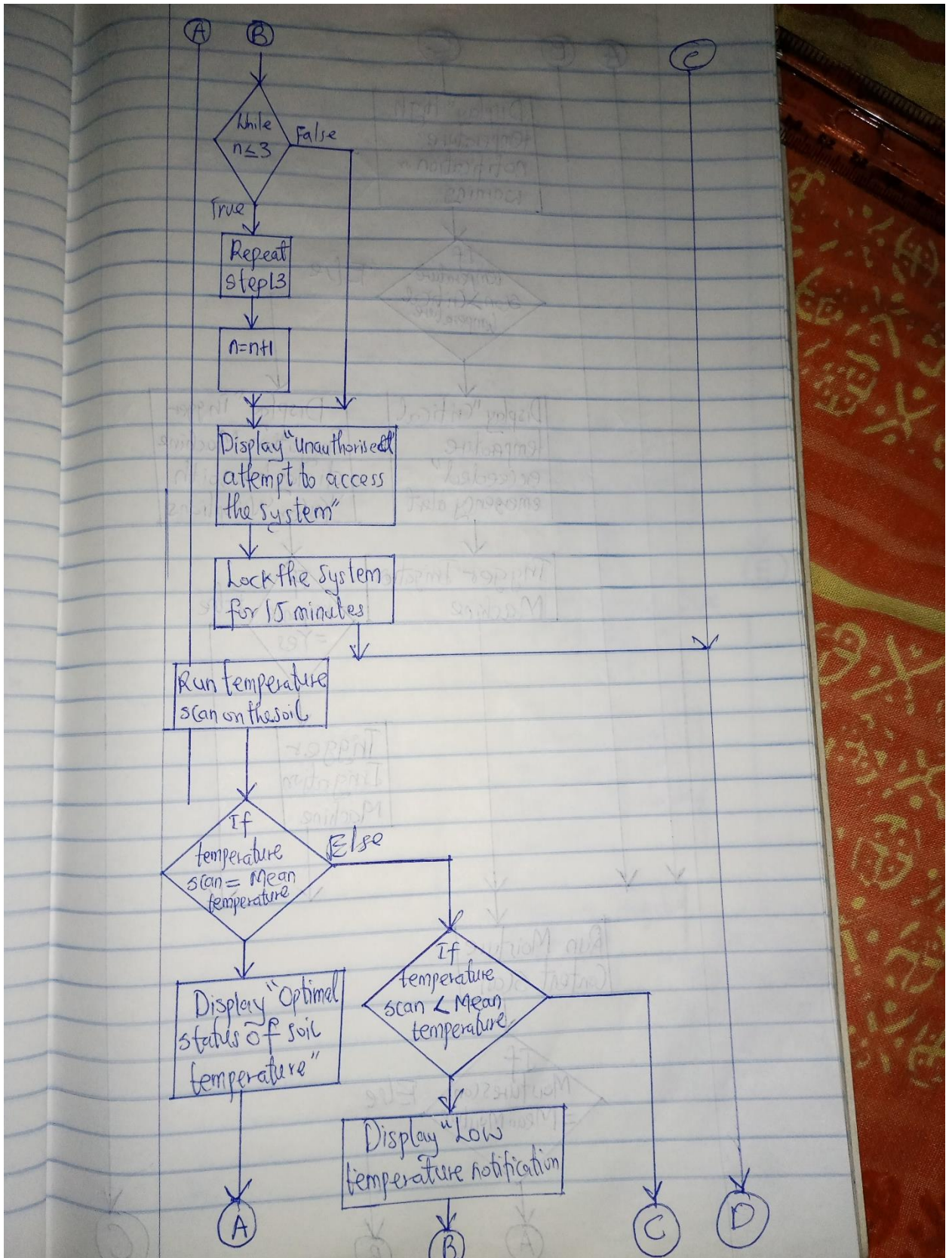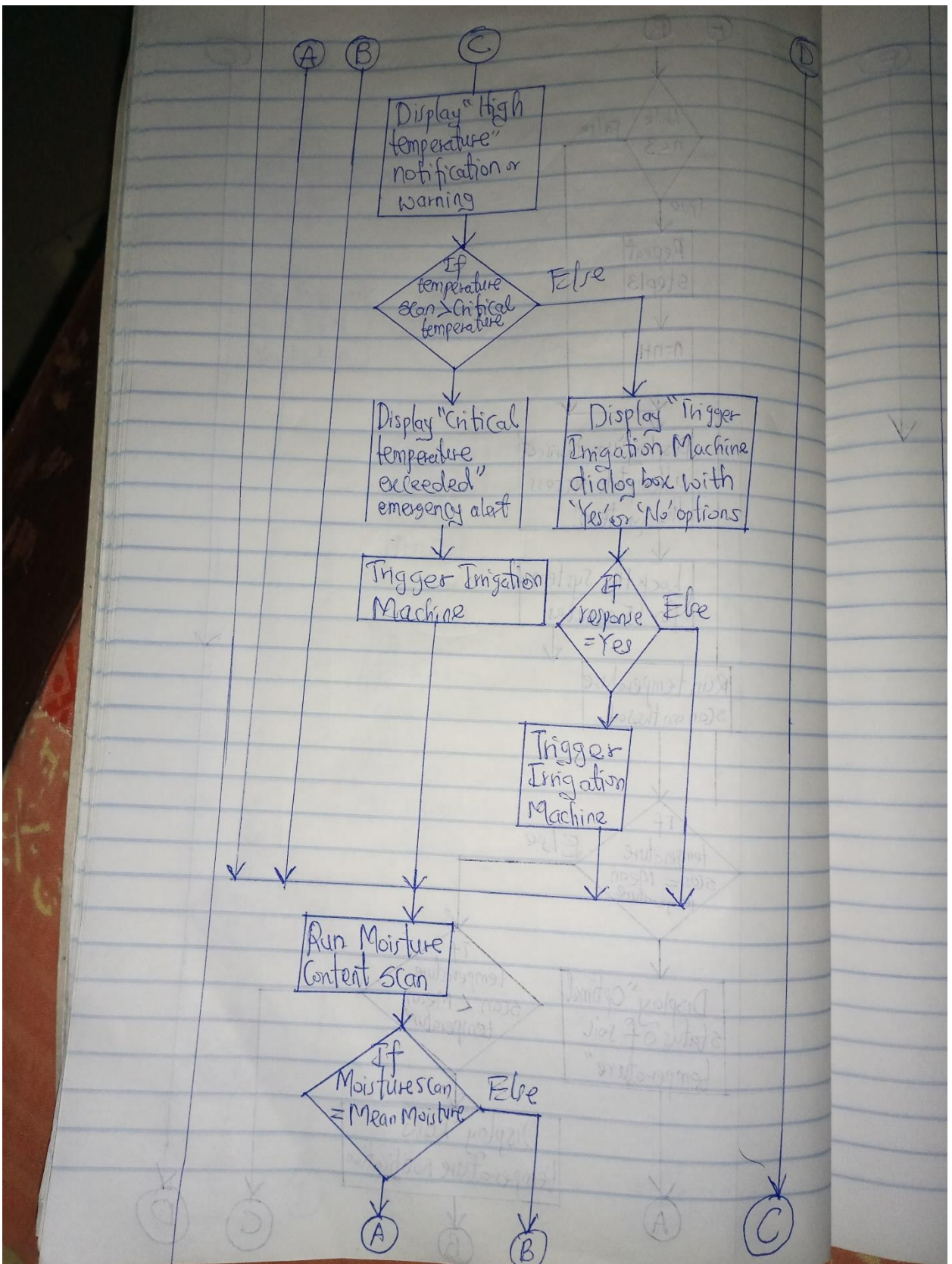
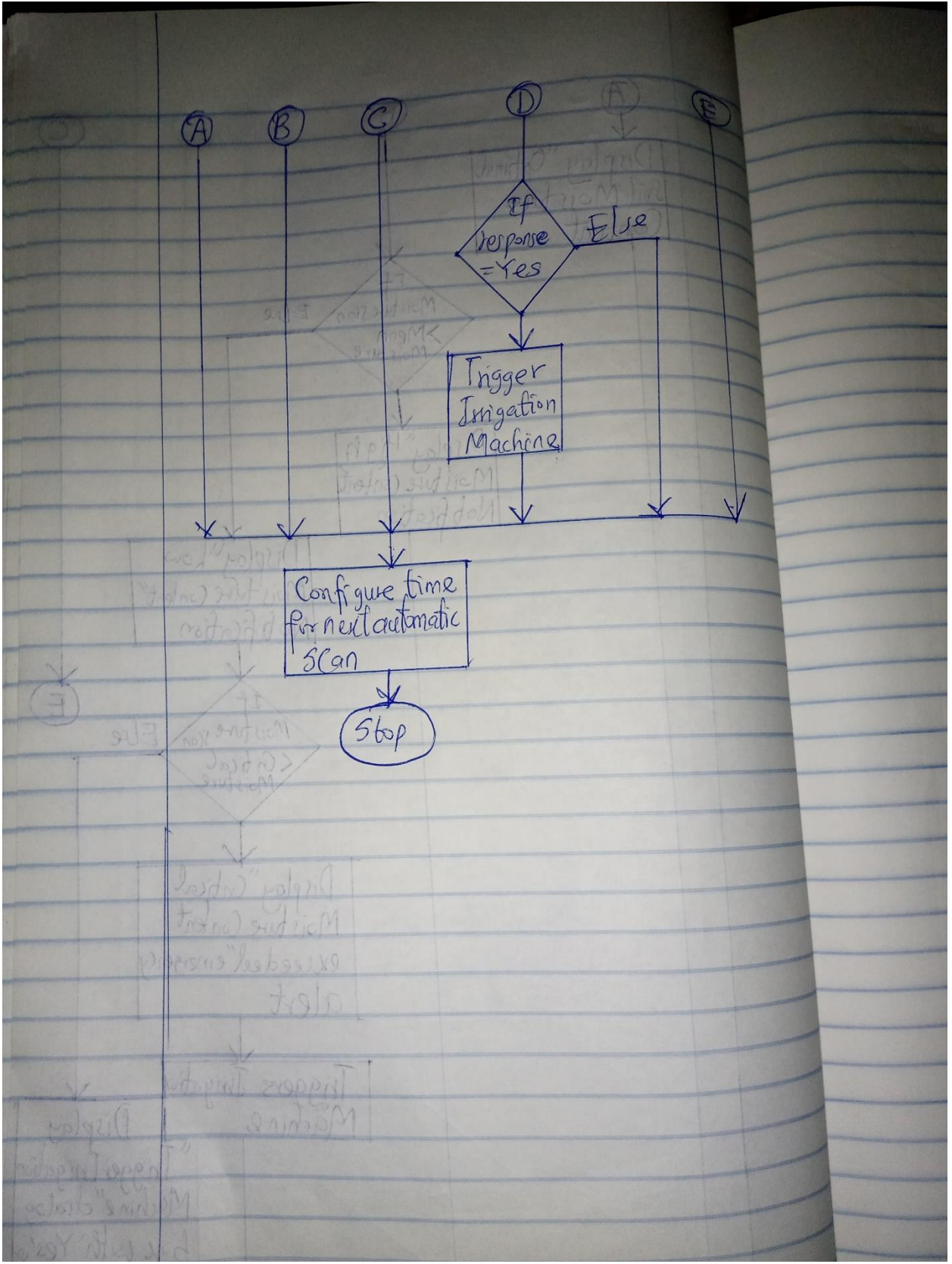Configure time for next automatic Scan

Stop

IMPLEMENTATION

The Software can be implemented by using any programming language on any suitable IDE.

TESTING AND DEBUGGING

The software will undergo a few test procedures after implementation with a test irrigation machine and debugged for error removal.

RELEASE AND UPDATE

The software after extensive testing and debugging will be released under the name "Irrigation - farming assistant". Updates to the software will follow as it deems fit for the managers to pursue in the future or in case of error discovery.

2.) HARDWARE AND SOFTWARE [...] THE

2. B

2.) HARDWARE AND SOFTWARE FEATURES OF THE APPLICATION SOFTWARE

HARDWARE

- The basic hardware feature of this application is a Computer system, ~~either~~ ranging from the Mini Computer to the Mainframe Computer depending the scale of operation and the technicalities of the Irrigation machine.
- This Computer system would be network-based either through wireless hardware transmission or wired network cables to transmit data.
- The security features such as the Password and PIN will require a keyboard and a Monitor for display as well as a scanner for facial recognition Audio microphones for Voice recognition and

fingerprint scanners for fingerprint scan.
- The system will store a lot of data and requires a memory device that can store or even back-up the information on the computer system.
- for the soil property scans, the system requires infra-red sensors or temperature sensors similarly it could require a galvanic cell as we mentioned earlier for measuring soil moisture content.
  These are a few hardware features among others

SOFTWARE

The software features are:

(i) GUI: The system requires a window-based GUI for easy communication between operators and software.

(ii) Operating System: As no software can work unless with the aid of an operating system. During the testing and debugging process, it will be effective to ascertain the operating systems that the software can work on comfortably without any glitches or errors.

(iii) Network security:
The system needs a lot of protection from hackers and other cyber-crime individuals so as to maintain availability, integrity and confidentiality of collected data. In this regard, professionals can be hired to frequently maintain this security.

(iv) Processing feature:
The software processing requires a real-time system processing so as to be update with time intervals for automatically switching on or off the irrigation machines and running scans on soil temperature and moisture content.
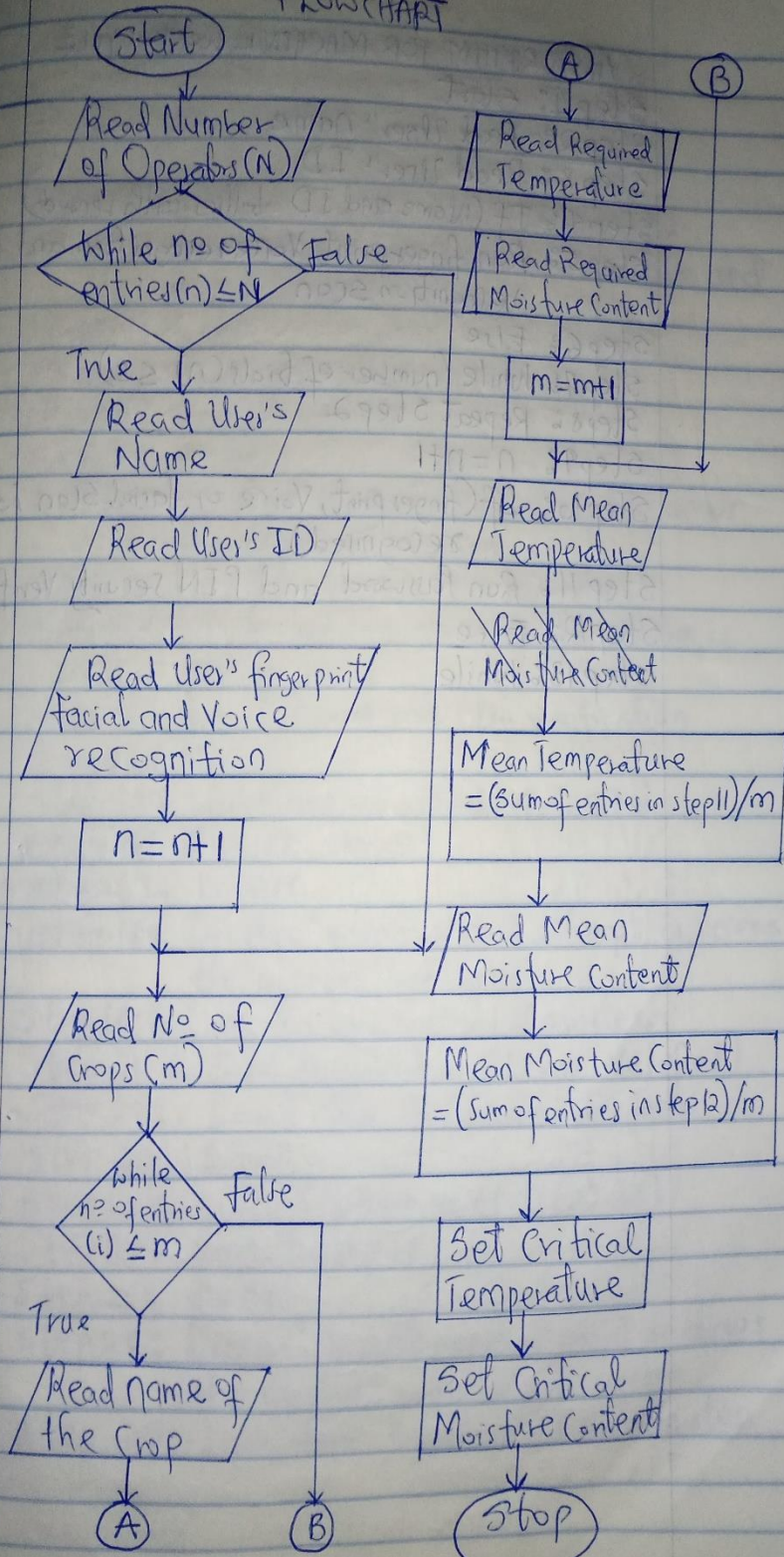
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ALGORITHM FOR SOFTWARE SET-UP

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Step 3: While (number of entries (n) $\leq N$)

Step 4: Read User's Name

Step 5: Read User's ID

Step 6: Read User's finger print, facial recognition and voice recognition

Step 7: $n = n+1$

Step 8: Read the number of Crops to be planted (m)

Step 9: While ($i \leq m$)

Step 10: Read the name of the Crop

Step 11: Read required temperature for Crop growth

Step 12: Read required Moisture Content for Crop growth

Step 13: $m = m+1$

Step 14: Read Mean temperature

Step 15: Mean temperature = (Sum of entries in Step11) / m

Step 16: Read Mean moisture content

Step 17: Mean moisture content = (Sum of entries in step 11)/m

Step 18: Set critical temperature with respect to Mean temperature

Step 19: Set Critical Moisture content with respect to Mean moisture content

Step 20: Stop

FLOWCHART

Start

Read Number of Operators (N)

While no of entries (n) ≤ N — **False**

True

Read User's Name

Read User's ID

Read User's finger print facial and Voice recognition

$n = n+1$

Read No of Crops (m)

While no of entries (i) ≤ m — **False**

True

Read name of the Crop

A

B

A

Read Required Temperature

Read Required Moisture Content

$m = m+1$

Read Mean Temperature

Read Mean Moisture Content

Mean Temperature = (Sum of entries in step 11)/m

Read Mean Moisture Content

Mean Moisture Content = (Sum of entries in step 12)/m

Set Critical Temperature

Set Critical Moisture Content

Stop

B

ALGORITHM FOR MACHINE WORK-CYCLE

Step 1: Start

Step 2: Read User's Name

Step 3: Read User's ID

Step 4: If (Name and ID tallies with record)

Step 5: Run finger print, Voice recognition and facial recognition scan

Step 6: Else

Step 7: While (Number of trials (n) ≤ 3)

Step 8: Repeat Step 2

Step 9: $n = n+1$

Step 10: Display "Unauthorized attempt to access the System" warning

Step 11: Lock the System for 15 minutes

Step 12: If (fingerprint, Voice or facial scan is recognised)

Step 13: Run Password and PIN verification

Step 14: Else

Step 15: While (number of trials (n) ≤ 3)

Step 16: Repeat Step 5

Step 17: $n = n+1$

Step 18: Display "unauthorized attempt to access the system" warning

Step 19: Lock the system for 15 minutes

Step 20: If (Password or PIN is verified)

Step 21: Load the Software interface

Step 22: Else

Step 23: While (number of trials (n) ≤ 3)

Step 24: Repeat Step 13

Step 25: $n = n+1$

Step 26: Display "Unauthorized attempt to access the System" warning

Step 27: Lock the system for 15 minutes

Step 28: Run temperature scan on the soil
Step 29: If (temperature scan = Mean temperature)
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Step 31: Else
Step 32: If (temperature scan < Mean temperature)
Step 33: Display "Low temperature" notification
Step 34: Else
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Step 36: Display "High temperature" Warning
Step 37: If (temperature scan > Critical temperature)
Step 38: Display "Critical temperature exceeded" emergency alert
Step 39: Trigger Irrigation Machine
Step 40: Else
Step 41: Display "Trigger Irrigation Machine" Dialog box with Yes or No options
Step 42: If (response = Yes)
Step 43: Trigger Irrigation Machine
Step 44: Else
Step 45: Run Soil Moisture Content scan
Step 46: If (Moisture scan = Mean Moisture)
Step 47: Display "Optimal Moisture content"
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Step 49: If (Moisture scan > Mean Moisture)
Step 50: Display "High Moisture Content" notification
Step 51: Else
Step 52: If (Moisture scan < Mean Moisture)
Step 53: Display "Low Moisture Content" notification
Step 54: If (Moisture scan < Critical Moisture Content)
Step 55: Display "Critical Moisture Content exceeded" emergency alert
Step 56: Trigger Irrigation Machine
Step 57: Else
Step 58: Display "Trigger Irrigation Machine" Dialog box with 'Yes' or 'No' options

Step 59: I
Step 60: Tr
Step 61: F
Step 62:
Step 63:

Step 59: If (response = Yes)
Step 60: Trigger Irrigation Machine
Step 61: Else
Step 62: Configure time for next automatic scan
Step 63: stop

FLOWCHART

Start

Read User's Name

Read User's ID

If Name & ID tally with record — Else

Run finger print, Voice and facial scan

While n ≤ 3 — False

True

Repeat step 2

n = n+1

Display Unauthorised attempt to access system

Lock System for 15 minutes

Run Password and PIN Verification

(A)   (B)

(A)

(B)

If Fingerprint, facial or voicescan tallies ——— Else

Run Password and PIN Verification

While n≤3 ——— False

True

Repeat step 5

n=n+1

Display "Unauthorised attempt to access the system"

Lock the system for 15 minutes

If Password or PIN is correct ——— Else

Load Software

(A)   (B)   (C)

Flowchart connectors and text:

- (A) (B) (C)

- Decision: While $n \leq 3$
  - False →
  - True ↓

- Process: Repeat step 3

- Process: $n = n+1$

- Process: Display "Unauthorised attempt to access the system"

- Process: Lock the system for 15 minutes

- Process: Run temperature scan on the soil

- Decision: If temperature scan = Mean temperature
  - Else →

- Process: Display "Optimal status of soil temperature"

- Decision: If temperature scan < Mean temperature

- Process: Display "Low temperature notification"

- (A) (B) (C) (D)

(A) (B) (C) (D)

Display "High temperature" notification or warning

↓

If temperature scan > Critical temperature ——— Else

↓ (Else →)

Display "Critical temperature exceeded" emergency alert

Display "Trigger Irrigation Machine dialog box with 'Yes' or 'No' options"

↓

Trigger Irrigation Machine

If response = Yes ——— Else

↓

Trigger Irrigation Machine

↓ ↓

Run Moisture Content Scan

↓

If Moisture scan = Mean Moisture ——— Else

↓ ↓

(A) (B) (C)

(D)   (A)   (B)   (C)

Display "Optimal Soil Moisture Content"

If Moisture scan > Mean Moisture   Else

Display "High Moisture Content" Notification

Display "Low Moisture Content" Notification

(E)

If Moisture scan < Critical Moisture   Else

Display "Critical Moisture Content exceeded" emergency alert

Triggers Irrigation Machine

Display "Trigger Irrigation Machine" dialog box with 'Yes' or 'No' options

(A)   (B)   (C)   (D)

(A)   (B)   (C)   (D)   (A)   (E)

If response = Yes   Else

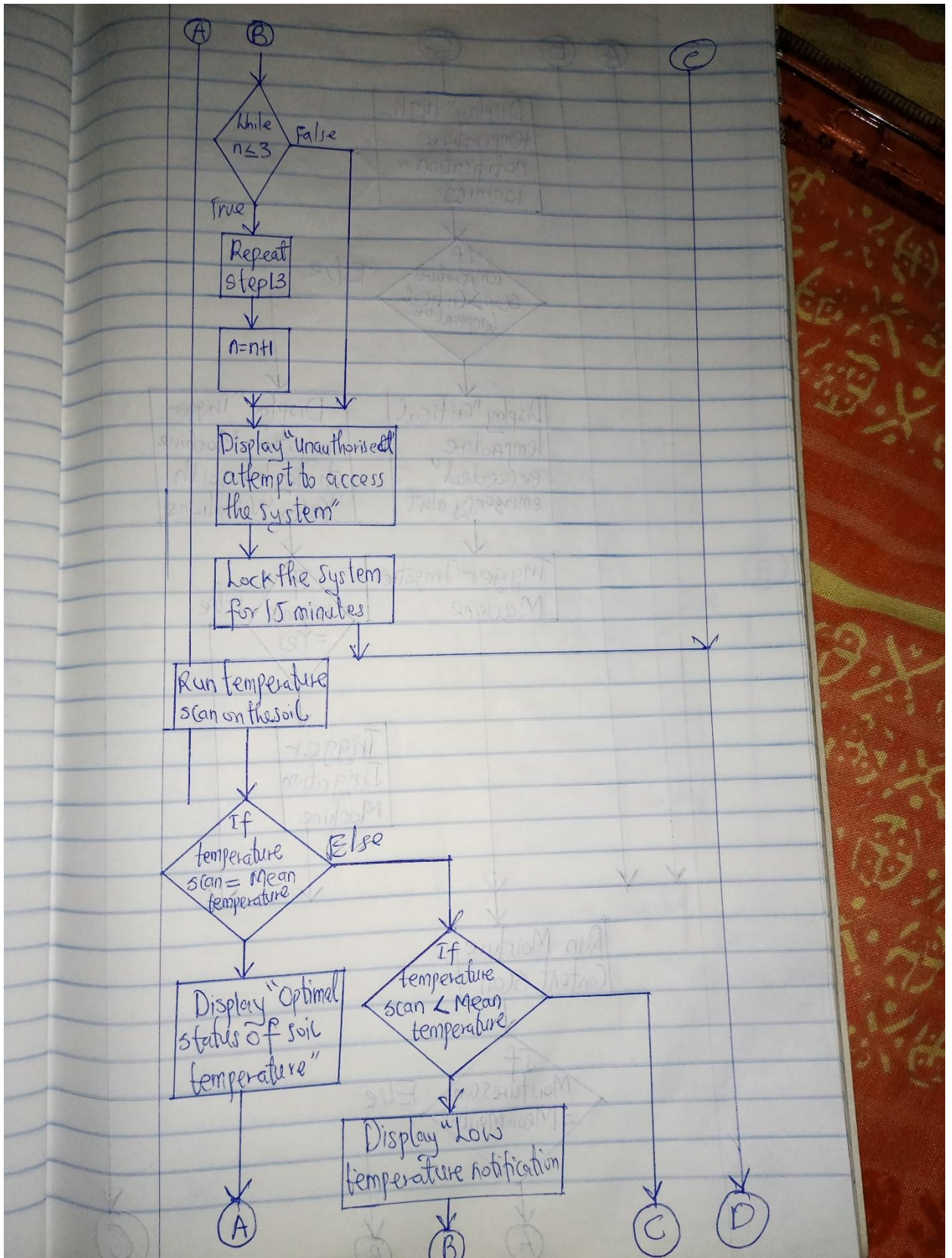Trigger Irrigation Machine
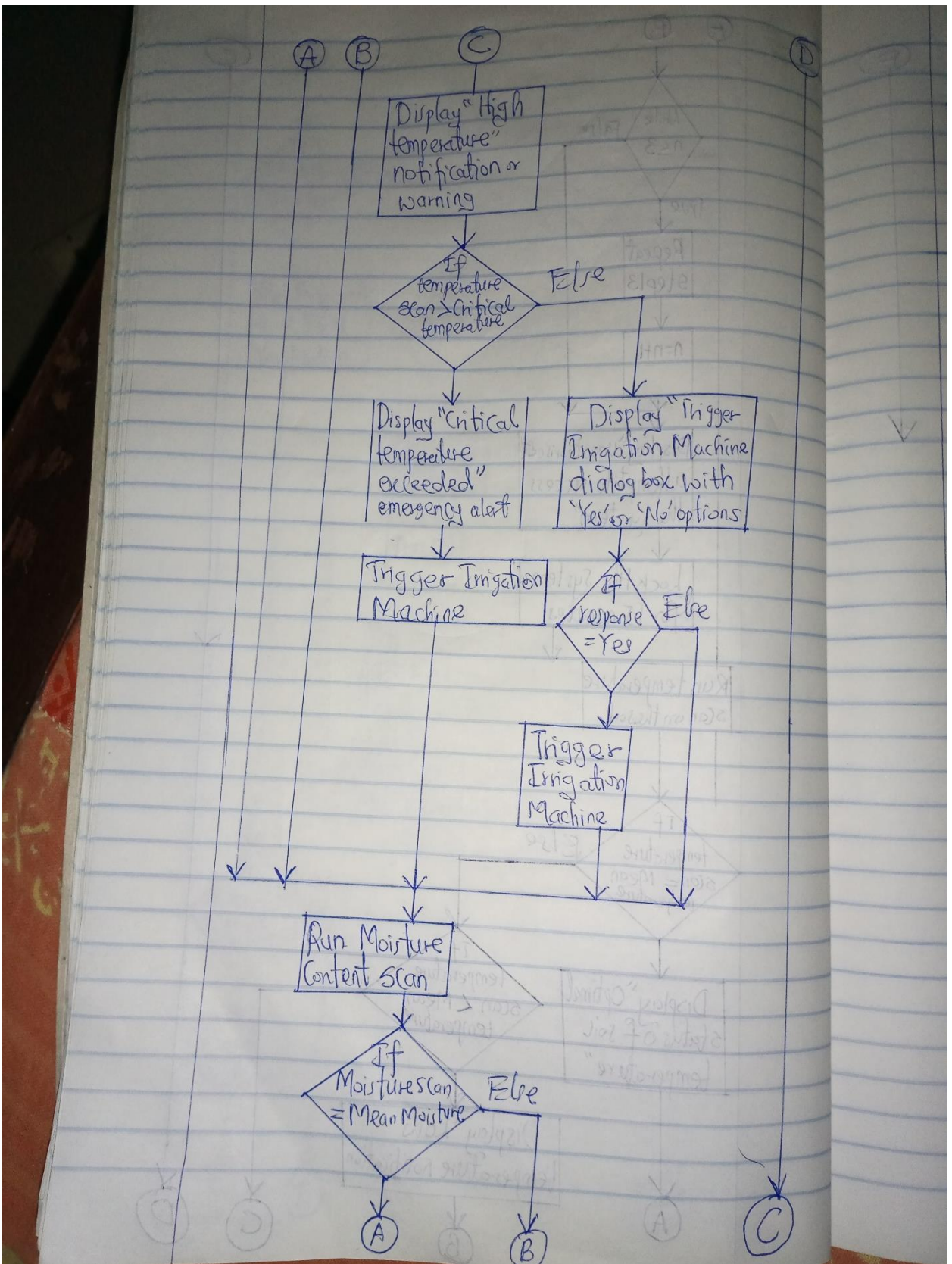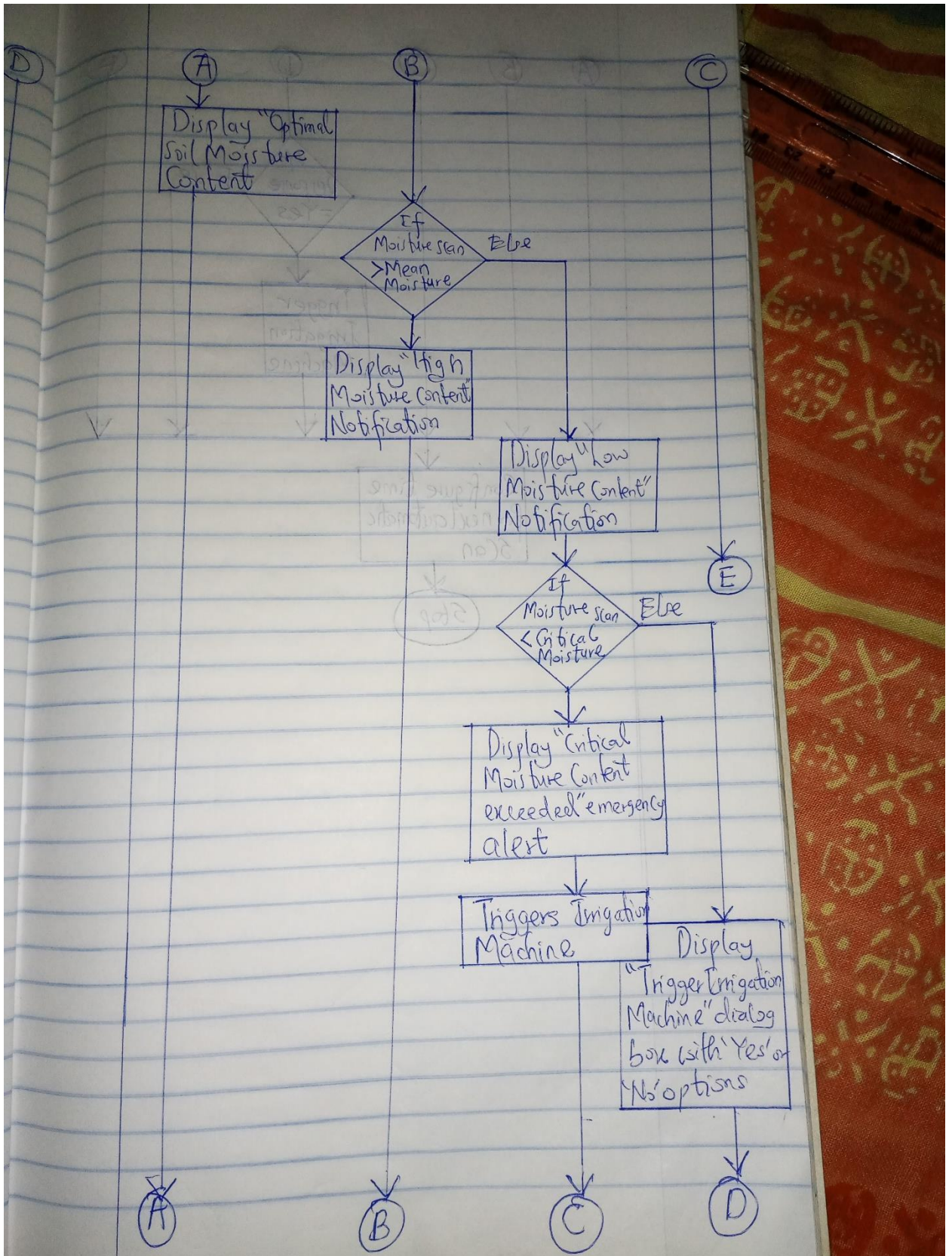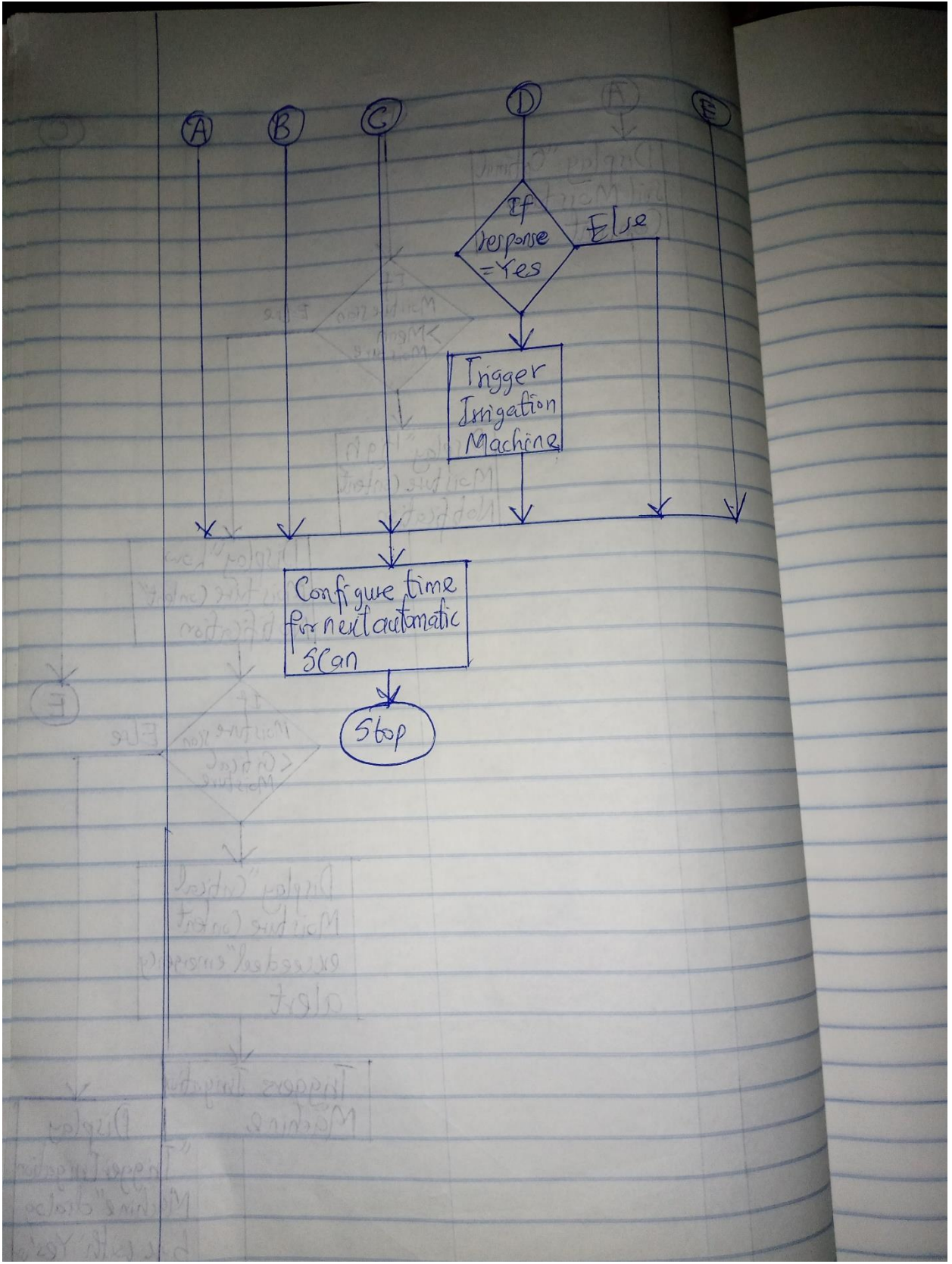
Configure time for next automatic Scan

Stop

4. D

4.) TOP - DOWN APPROACH

SOFTWARE
(Irrigation - farming Assistant)

Time
Configuration
System

Control &
Alarm System

Scan/Diagnosis
System

Emergency
trigger
System

Warning
&
Notification

Critical/
Emergency
alerts

Soil Temperature
Scan

Soil
Moisture
Content
scan

Security
System

Password   PIN   Fingerprint   Facial   Voice
                                recognition   recognition