

# MICROPROCESSOR DESIGN ASSIGNMENT

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# PROBLEM STATEMENT

## **P22: System to be designed: Cash Register**

The system to be designed is a **Cash Register** a modified form of the one available in the institute cafeteria. The system is a stand-alone with inputs provides via a keyboard. Outputs are available via a LCD display. System gets power via the standard power outlet. System has chargeable battery available with it, that is used a battery back-up of the RAM. The battery charges itself when the system is on. A fully-charged battery has a life-time of 36 hours.

### **System Requirements**

#### **Keyboard**

Format of the keyboard is shown below

#### **Display**

Display is a Liquid Crystal Display .Size of the Display is 16 x 1. (16 characters on one line).The LCD is connected to the micro-controller through a display driver in this case HD44780 which is available with the LCD

### **System Operation**

- The system is Interactive in nature
- The system is provided security by a hardware lock. Only when the lock is open the system is functional.
- The lock system comes with a key. When the key is turned, the lock circuit gives a TTL high output else it gives a TTL low output.
- If the user presses a key on the keyboard when the lock is closed the system turns on a buzzer.

- At any point of time when the system is operational if the lock is closed the system must be disabled.
- A pulse of frequency 4 KHz turns on the buzzer. Buzzer is turned on for 1 Minute and then turned off.
- After the lock is open, the LCD is turned on and it displays "System Ready".
- The user has to then press the **Mode** button on the keyboard. The LCD then displays "Select Mode".
- The user can operate in any of the two modes **Transaction/ Program**. Transaction is the normal function and in the Program Mode, user is allowed to add new items and their cost.
- Every item has an item code and a cost associated with it.
- If the user presses the **Trans** key the system enters into transaction mode. The LCD displays "Enter Transaction Mode Y/N ?".
- User then has to press **Y** to confirm. If user presses **N** it goes back to Mode Select display.
- In the Transaction mode user is expected to enter the item code and the quantity. Item code has to be entered using the **Item No.** key followed by the item code. The item code can be entered with the help of the numeric keys **0-9**. At the end of the item code the user has to press the **Enter** key. The item code will be then displayed on the LCD.
- User can press **Backspace** key to change the value of last key press or he can press **Cancel** to delete the whole entry.
- After the item code is displayed, user has to enter the quantity by pressing **Quantity** key followed by quantity of the item (using the numeric keys) a person wishes to buy and the **Enter** key.
- Automatically the total cost of the item will be displayed on the LCD.
- The user can continue entering all the items and finally press **Total** to display the total cost.
- In the Program mode user can add new items or delete an item. If the cost of an item is to be updated it has to first be deleted and re-added to the item list in memory.
- When you add a new item you have to enter the item number by using the **Item no.** key and the cost using the **Cost** key. After the cost has been keyed in the user must press **Enter**.
- The inter-active display will confirm your entry before storing it in the memory.
- If an item is to be deleted it is done using the **Del Item** key. Then user is required to press the **Item No** key followed by the item code and then press **Enter**.
- The inter-active display will confirm your entry before deleting it from the memory.

## DESIGN SPECIFICATIONS

1. Base address of 8255 of keypad interface is 00h
2. Base address of 8285 of lcd interface is
3. Memory goes from 00000-2FFFFh
4. 2 rom chips of 4 k is used
5. 2 ram chips 2k
6. 8253 is used to generate a stobe pulse of 4 khz for 1 min
7. Relay is used to supply the current to buzzer if 8255 is unable to provide sufficient current.
8. Clock of 8086 is 8 Mhz.

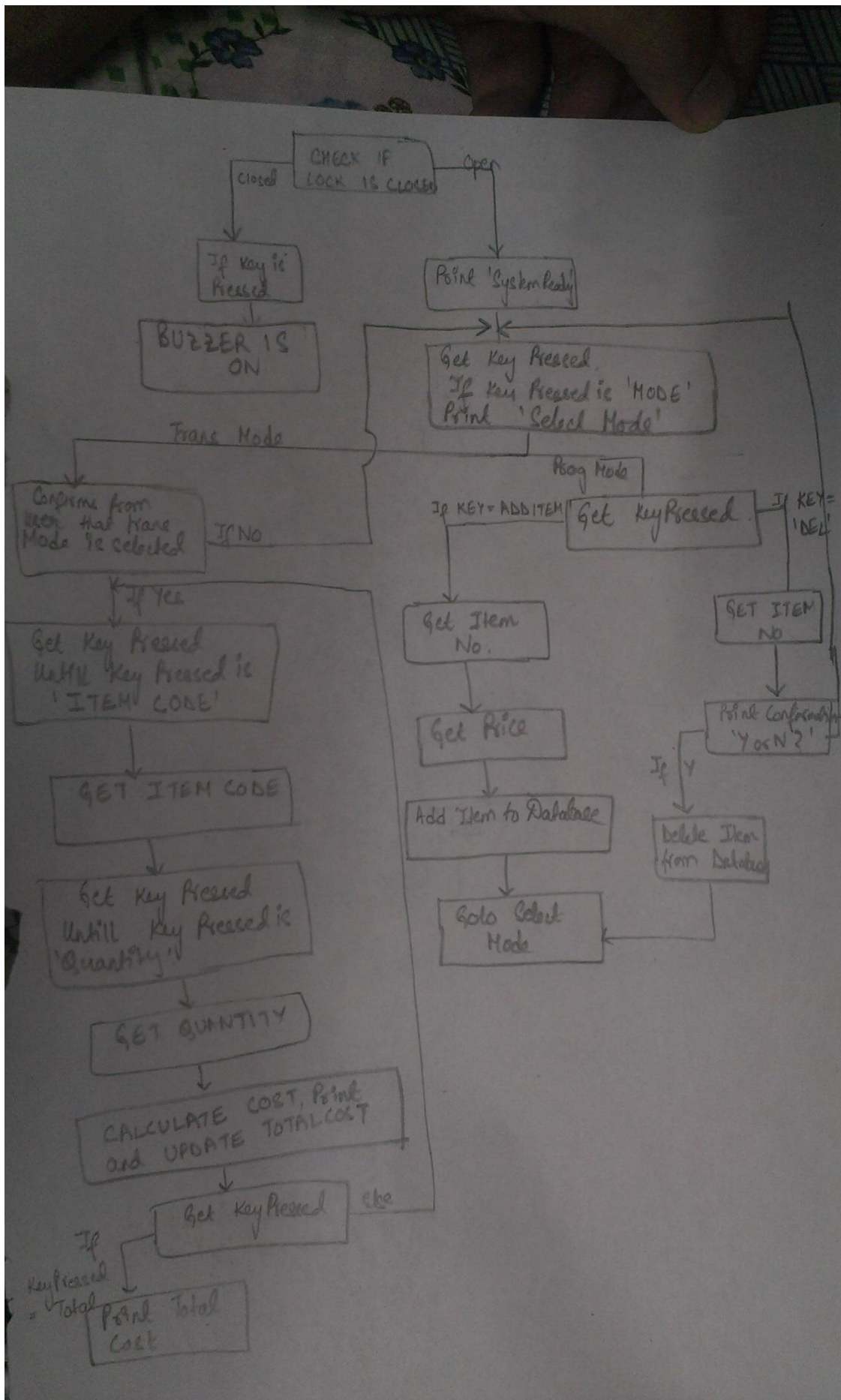
# ASSUMPTIONS

1. Item No is always a 2 digit number.
2. Quantity is always a single digit number.
3. The first digit of quantity and item no is always a digit i.e. backspace and cancel can only be pressed after 1 digit has been entered.
4. Price is single digit no.
5. For Delete Option a valid item no. is inserted.
6. Values printed of cost and quantity is in hex.

# COMPONENTS USED

1. 8086 microprocessor.
2. 8255.
3. 74LS245
4. 74LS373
5. 2732
6. 6116
7. LOGIC GATES
8. 8253
9. 74S133
10. SWITCHES
11. BUZZER
12. 74S02
13. LM020L

# FLOWCHART



# CIRCUIT DIAGRAM

