ASSIGNMENT1

Credit:William

50 points

Your program will simulate a simple change maker for a vending machine. It will start with a stock of coins and dollars. It will then repeatedly request the price for an item to be purchased or to quit. If given a price, it will accept nickels, dimes, quarters, one-dollar and five-dollar bills—deposited one at a time—in payment. When the user has deposited enough to cover the cost of the item, the program will calculate the coins to be dispensed in change. Alternately, the user can cancel the purchase up until full payment has been deposited, in which case, your program will calculate the coins to be dispensed to refund any partial payment already deposited. With each purchase, the program will update the stock of coins and dollars. Before quitting, it will output the remaining stock of coins and dollars. The specifications are spelled out more thoroughly below. An example interaction with our program appears at the end of this description. All change and refunds must be in coins only, and must use the minimum number of coins possible.

Background

The algorithm for calculating the numbers of coins of each denomination to dispense so as to minimize the total number of coins is an example of a greedy algorithm. Since each coin is at least twice the value of the previous coin, you can start by figuring out the most number of quarters you can dispense (without exceeding the amount), then the most number of dimes, and then the number of nickels. Knowledge of greedy algorithms is not required to complete this assignment. If you are curious, you can read http://en.wikipedia.org/wiki/Greedy_algorithm.

Project Description / Specification

Your program must meet the following specifications:

1. At program start, assume a stock of 25 nickels, 25 dimes, and 25 quarters. Print the contents of the stock.
2. Repeatedly prompt the user for a price in the form `xx.xx`, where `x` denotes a digit
3. When a price is entered:
    - Check that the price entered is a (non-negative) multiple of . 05 (i.e., it is payable in nickels). If not, then print an error message and start over requesting either a new price.
    - Print a menu for indicating the coin/bill deposited or to cancel payment.
    - Prompt for a selection from this menu.
    - If the user enters an illegal selection, re-prompt for a correct one.
    - Following each deposit, print the remaining amount owed (indicate the number of dollars and the number of cents).
    - When full payment has been deposited or a 'c' has been entered, determine the coins to be dispensed in change or as refund. This calculation will depend on the amount to be dispensed and also on the number of coins left in the stock. For example, the least number of coins needed to make up $1.30 is 6 — 5 quarters and 1 nickel. But if there are only 3 quarters, 3 dimes, and 10 nickels left in the stock, then the least number is 11 — 3 quarters, 3 dimes, and 5 nickels.
    - Print the numbers of the coins to be dispensed and their denominations. (Omit a denomination if no coins of that denomination will be dispensed.)
    - In case exact payment is deposited, print a message such as "No change."
    - If the change cannot be made up with the coins remaining, dispense the coins available without exceeding the change

amount and indicate the amount still due the user, which will have to be collected from a store manager. For example, if the stock contains one nickel, no dimes, and a quarter and if the change amount is 15 cents, dispense just the nickel and indicate the user should collect 10 cents from a store manager.

- Print the contents of the stock following the transaction.

Sample Interaction (user inputs shown in red):

```
Welcome to the vending machine change maker program
Change maker initialized.
Stock contains:
   25 nickels
   25 dimes
   25 quarters
   0 ones
0 fives
Enter the purchase price (xx.xx) : 1.96
Illegal price: Must be a non-negative multiple of 5 cents.
Enter the purchase price (xx.xx) : 1.95
Menu for deposits:
  'n' - deposit a nickel
  'd' - deposit a dime
  'q' - deposit a quarter
  'o' - deposit a one dollar bill
  'f' - deposit a five dollar bill
  'c' - cancel the purchase
Payment due: 1 dollars and 95 cents
Indicate your deposit: 1
Illegal selection: 1
Payment due: 1 dollars and 95 cents
Indicate your deposit: o
```

```
Payment due: 95 cents
Indicate your deposit: o
Please take the change below.
   1 nickels
Stock contains:
   24 nickels
   25 dimes
   25 quarters
   2 ones
   0 fives
Do you want to continue: yes
Enter the purchase price (xx.xx) : 3.25
Menu for deposits:
  'n' - deposit a nickel
  'd' - deposit a dime
  'q' - deposit a quarter
  'o' - deposit a one dollar bill
  'f' - deposit a five dollar bill
'c' - cancel the purchase
Payment due: 3 dollars and 25 cents
Indicate your deposit: o
Payment due: 2 dollars and 25 cents
Indicate your deposit: d
Payment due: 2 dollars and 15 cents
Indicate your deposit: d
Payment due: 2 dollars and 5 cents
Indicate your deposit: o
Payment due: 1 dollars and 5 cents
Indicate your deposit: d
Payment due: 95 cents
Indicate your deposit: c
Please take the change below.
   9 quarters
1 nickels
Stock contains:
   23 nickels
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```
   28 dimes
   16 quarters
   4 ones
   0 fives
Do you want to continue: yes
Enter the purchase price (xx.xx) : .05
Menu for deposits:
  'n' - deposit a nickel
  'd' - deposit a dime
  'q' - deposit a quarter
  'o' - deposit a one dollar bill
  'f' - deposit a five dollar bill
  'c' - cancel the purchase
Payment due: 5 cents
Indicate your deposit: f
Please take the change below.
   16 quarters
   9 dimes
   1 nickels
Stock contains:
   22 nickels
   19 dimes
   0 quarters
   4 ones
   1 fives
Do you want to continue: yes
Enter the purchase price (xx.xx) : 25
Menu for deposits:
  'n' - deposit a nickel
  'd' - deposit a dime
  'q' - deposit a quarter
  'o' - deposit a one dollar bill
  'f' - deposit a five dollar bill
  'c' - cancel the purchase
Payment due: 25 dollars and 0 cents
Indicate your deposit: f
```

```
Payment due: 20 dollars and 0 cents
Indicate your deposit: f
Payment due: 15 dollars and 0 cents
Indicate your deposit: f
Payment due: 10 dollars and 0 cents
Indicate your deposit: f
Payment due: 5 dollars and 0 cents
Indicate your deposit: c
Please take the change below.
   19 dimes
   22 nickels
Machine is out of change.
See store manager for remaining refund.
Amount due is: 17 dollars and 0 cents
Stock contains:
   0 nickels
   0 dimes
   0 quarters
   4 ones
   5 fives
Do you want to continue: yes
Enter the purchase price (xx.xx) : .35
Menu for deposits:
  'n' - deposit a nickel
  'd' - deposit a dime
  'q' - deposit a quarter
  'o' - deposit a one dollar bill
  'f' - deposit a five dollar bill
  'c' - cancel the purchase
Payment due: 35 cents
Indicate your deposit: q
Payment due: 10 cents
Indicate your deposit: d
Please take the change below.
  No change due.
Stock contains:
```

```
   0 nickels
   1 dimes
   1 quarters
   4 ones
   5 fives
Do you want to continue: yes
Enter the purchase price (xx.xx) : .35
Menu for deposits:
  'n' - deposit a nickel
  'd' - deposit a dime
  'q' - deposit a quarter
  'o' - deposit a one dollar bill
  'f' - deposit a five dollar bill
  'c' - cancel the purchase
Payment due: 35 cents
Indicate your deposit: q
Payment due: 10 cents
Indicate your deposit: q
Please take the change below.
   1 dimes
Machine is out of change.
See store manager for remaining refund.
Amount due is: 5 cents
Stock contains:
   0 nickels
   0 dimes
   3 quarters
   4 ones
   5 fives
Do you want to continue: no
```