A hand-held restaurant credit card reader includes a scanner and an LCD display, shown below.

When a credit card is scanned, a sequence of 8-bit codes appears on the scanner’s data output lines (SCAN_DATA8-1). Each byte is held on these lines for about 1 microsecond; when that byte is stable on these lines, a short pulse (0-1-0) is generated on the scanner’s DATA_VALID output line. The data byte should be read while that pulse is active.

To display a character, place its ASCII code on the display’s data input lines (DATA_IN8-1) and then raise the display’s STROBE input line from low to high (it can be returned low at any time.) When the STROBE signal is thus activated, the display’s READY* output line goes to its inactive state (high) until the display has processed that character. Then READY* returns to its active state (low). The DATA_IN8-1 lines must not be disturbed while the display is in a “not ready” state.

The scanner is to be interfaced to our microcontroller using GPIOB pins, and the display using GPIOC pins. List appropriate GPIO pins to connect to each of the signal lines on these two devices, noting which must be input pins and which output pins on the GPIO port.

1. Write a subroutine that initializes the port pins connected to these two devices.
2. Write a subroutine that returns, in R0, the 8-bit code of the next byte produced by the scanner. This subroutine should use a “busy/wait” structure. Note that each byte requires that you wait for DATA_VALID to be active (high), read SCAN_DATA, and return the data to the calling function.
3. Write a subroutine that will display a string of ASCII characters, stored in array “String” in data memory. The end of the character string is the ASCII "null" character (0x00). Again, busy/wait operation should be used. Note that each character requires that you (1) wait until READY* is active (low), (2) write the character to DATA_IN, (3) raise STROBE to 1, and (4) lower STROBE to 0.

Enter the program into uVision5, assemble the program, and print it. (It will not be executed.)