Embedded Systems

Sheet 3

Interfacing with Sensor Devices,

Interfacing with Simple Display Devices,

Interfacing with Audio Devices

For the following questions: provide both the software part and draw the hardware schematic for all required embedded systems.

Q1:

Develop an embedded system that produces an alarm sound signal. Try to tune the sound signal to make a loud and noticeable alarm.

Q2:

Develop following alarm systems:

1. System produces alarm signal if any motion detected around the system.
2. System produces alarm signal if any human moves beside the system.
3. System produces alarm signal if any noise is detected.
4. System produces alarm signal if any non-normal sound is detected.
5. System produces alarm signal if the system is moved (horizontal movement, rotational movement, inclined movement).
6. System produces alarm signal if the light is turned on.
7. System produces alarm signal if the room lighting is altered.
8. System produces alarm signal if the room temperature raises over 70 degrees.
9. System produces alarm signal if the room temperature is altered.
10. System produces alarm signal if the system is started to vibrate (Car or machine is turned-on).

Q3:

Develop a simple voltage meter. The system should read one analog input X (0 → 5 V). Know that the actual voltage is calculated using the formula (Y = 20 * X - 50).

The meter should produce 5-digit real values including the sign and the fraction dot (SYY.XX where S: Sign, YY: Integer Part, XX: Fraction Part).

Q4:

Develop signal meters for following physical quantities:

1. Temperature (Use push-button to toggle between Celsius and Fahrenheit).
2. Vibration (0 to 100%)
3. Sound Level (0 to 100%)
4. Light Intensity (Lux)

Q5:

Develop speed measurement device for (speed in X direction, speed in Y direction, rotational speed). Use push-button to toggle between those values.

Q6:

Develop distance measurement device. Use push-button to toggle between those values.

Q7:

Assume you have only one Gyroscope and you want to measure the distance traveled by a car, develop an embedded solution for this problem. (Do not resolve the connection and wiring issue).