- General Notes for all the projects:
  1- Arduino is FORBIDDEN to be used
  2- There is no constraint on a specific microcontroller but it MUST have a simulation library on protues.
  3- All the timing related activities MUST be handled using RTOS tasks.
  4- It is FORBIDDEN to send code which is not compiled.
  5- The output deliverables will be as followed:
    a- Your Complete source code.
    b- Your simulation protues file.
    c- The output hex file.
    d- A word document includes: Your design block diagram, UMLs diagrams, a system user manual (With screen shots) and Name of compiler.

Project ID: IGPT_ALEX_0001:

Project Nam.: Password based DoorLock system.

Project Description:

The system should implement the following requirements:

- The hardware interface will be a 3*4 Keypad, a 2*16 character LCD and an LED.
- Once the system powered on, a moving welcome screen will be displayed for 5 seconds.
- After the 5 seconds passed the the system will check its internal conditions and do the following.
- If it was the first time to switch on the system, the system should ask the user to enter the system password.
- This password will be the password that will be checked in the new system power on.
- Password is consisted of only 6 numbers appears as *.
- Numbers from 0 to 9 will be used to enter password.
- '*' Button will be used to clear one item and '#' button will be used to confirm.
- Every button is used to do one action per press (for number buttons one press will display one number).
- '*' button will have no action if the screen is empty,
- '#' button will have action only if the number of entered digits equal to 6.

Req ID	Description
ID_001	- The hardware interface will be a 3*4 Keypad, a 2*16 character LCD and an LED.
ID_002	- Once the system powered on, a moving welcome screen will be displayed for 5 seconds.
ID_003	- After the 5 seconds passed the the system will check its internal conditions and do the following.
ID_004	- If it was the first time to switch on the system, the system should ask the user to enter the system password.
ID_005	- This password will be the password that will be checked in the new system power on.
ID_006	- Password is consisted of only 6 numbers appears as *.
ID_007	- Numbers from 0 to 9 will be used to enter password.

ID_008	-	'*' Button will be used to clear one item and '#' button will be used to confirm.
ID_009	-	Every button is used to do one action per press (for number buttons one press will display one number).
ID_010	-	'*' button will have no action if the screen is empty,
ID_011	-	'#' button will have action only if the number of entered digits equal to 6.
ID_012	-	If it is not the first time to power up the system, the system shuld ask the user to enter the old password.
ID_013	-	Requirements ID_006 to ID_011 will be applicable at this part also.
ID_014	-	The system shall compare the entered password with the one saved.
ID_015	-	If the password is matched the LED will be turned on and success message will be displayed on the screen.
ID_016	-	If the password is not matched, the system will give the user another chance to enter the password.
ID_017	-	The maximum number of triers is equal to 3.
ID_018	-	The number of triers will preserve its value even if the system powered off.
ID_019	-	If the user exceeds the maximum number of triers, the system shall display a seconds counter (25 seconds) and then number of triers will be reset.
ID_020	-	Seconds counter will preserve its value even if the system power off.
ID_021	-	The system should provide a button to reset the password (Make the system ask the user for the new password at power on).
ID_022	-	ID_021 will be valid only if a success pass access happened and the button was pressed for exactly three seconds.

Project ID: IGPT_ALEX_0002:

Project Nam.: Automatic Room Light Controller with Visitor Counter , LDR

Project Description:

The system should implement the following requirements:

Requirement ID	Description
ID_001	The hardware interface shall be consisted of Two Push buttons to simulate the motion sensor, an LED and an LDR.
ID_002	The person direction (enter to or exit from) the room will be detected by the order of receiving the push buttons signals.
ID_003	Each push button will be sampled every 100 ms.
ID_004	The Push button signal will be considered as active if the old sample is high and the new sample is low.
ID_005	If the person direction was enter, the number of persons will be increased.
ID_006	If the person direction was exit, the number of persons will be decreased.

ID_007	The time between the two buttons signals shall not exceed 500ms.
ID_008	If the time between the two buttons signals exceeds the 500ms it shall not be considered.
ID_009	If the number of persons is higher than 0, the lighting system shall be activated else it shall be deactivated (Turned off).
ID_010	External light shall be read using the LDR.
ID_011	LDR signal shall be read each 50 ms.
ID_012	The LED will simulate the light power which will be controller using PWM.
ID_013	PWM signal shall be updated every 50 ms.
ID_014	The light value will be inversely proportional to the analogue value read from the LDR.

Project ID: IGPT_ALEX_0003:

Project Nam.: Digital cLock with LCD and KeyPad

Project Description:

The system should implement the following requirements:

Requirement ID	Description
ID_001	The hardware interface is consisted of a 2*16 character LCD, a ds1307 RTC and 3*4 phone keypad.
ID_002	After power on, the system will display a moving welcome screen for 5 seconds.
ID_003	After that the system will display the calendar data on the screen.
ID_004	The first row will be consisted of the time in the form hh:mm:ss am/pm
ID_005	The second row will be consisted of the data on the form yyyy:mm:dd
ID_006	The system will get the time and data from the RTC.
ID_007	The system will read the RTC data periodically every 100 ms.
ID_008	The system shall scan the Key pad every 200 ms.
ID_009	If the button '*' is pressed, the system the change the time display system (from 12 hours to 24 hours or the inverse).
ID_010	If the button '#' is pressed for 3 seconds, the system will display the time setting screen.
ID_011	The selected time element is the element which will be applicable to change.
ID_012	The blinking time will be 250ms on and 250 ms off.
ID_013	The default blinking element will be the hours.
ID_014	If the 2 button is pressed the blinking element will be incremented.
ID_015	If the 8 button is pressed, the blinking element will be decremented.
ID_016	If the 4 button is pressed, the blinking element will be changed to the left one.
ID_017	If the 4 button is pressed and the current blinking element is the most left one, the system shall not change the blinking element.
ID_018	If the 6 button is pressed, the blinking element shall be changed to the right one.
ID_019	If the 6 button is pressed and the current blinking element is the most right one, the system shall not change the blinking element.
ID_020	If the 5 button is pressed, the blinking element will be changed to the element in the other row.

ID_021	If the # button is pressed, the system shall save the new time and date to the RTC and go back to the reading state.

Project ID: IGPT_ALEX_0004:

Project Nam.: Ultrasonic Distance Meter with Buzzer indication

Project Description:

The system should implement the following requirements:

Requirement ID	Description
ID_001	The system is consisted of the microcontroller unit, a function generator to simulate the ultrasonic sensor signal, three push buttons, a buzzer and two seven segment displays.
ID_002	The Three push buttons are active low.
ID_003	The two seven segments display are common cathode and are connected to the same port.
ID_004	The seven segments displays refreshment time is 20 ms.
ID_005	The push buttons refreshment time is 100ms.
ID_006	The Function generator shall simulate the timing of an alra sonic sensor with maximum distance equal to 1 meter.
ID_007	The Push buttons will be used by the system to set the target distance in CM from 2 to 99
ID_008	if the first push button is pressed, the system shall increment the number shown on seven segment display
ID_009	If the second push button is pressed, the system shall decrement the number shown on seven segment display.
ID_010	No action will be done if an increment requested over 99.
ID_011	No action will be done, if a decrement requested under 1.
ID_012	If the third push button is pressed, the set point will be saved.
ID_013	The saved set point will nt be lost after power off.
ID_014	If the detected distance from the sensor simulator is higher than the set point buzzer will blink.
ID_015	If the detected distance from the sendor simulator is less than or equal the set point, the buzzer will be silent.
ID_016	The buzzer blinking time is 500ms.

Project ID: IGPT_ALEX_0005:

Project Nam.: Fan speed controller with temperature

Project Description:

The system should implement the following requirements:

Requirements	Description
ID_001	The system objective is to view temperature and control fan with DC motor speed

ID_002	The system is consisted of TC72 temperature sensor, a character LCD and a dc motor fan.
ID_003	The system shall get the temperature data every 100ms.
ID_004	The system shall calculate the average of the last three measurements.
ID_005	The system will display the average value of the screen.
ID_006	If the average value was less than 27 degree Celsius, the fan will be stopped.
ID_007	If the average value was higher than 27 degrees Celsius, the fan speed will be proportional to the degree value: From 28 to 35 → 25% of its top speed. From 36 to 42→ 50% of its top speed. From 43 to 50→ 75% of its top speed. From 51 to 55→ 100% of its top speed.
ID_008	The fan motor control frequency shall be 1 Khz.
ID_009	If the maximum temperature exceeded the 55 value for 10 seconds a buzzer shall be enabled.

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