	SKIT	Teaching Process
1 POTONI	Doc Code:	EC.SKIT.Ph5b1.F03
BANGALORE	Title:	Course Lab Manual

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Rev No.: 1.0

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Note : Remove "Table of Content" before including in CP Book



17ECL67: Embedded Controller Lab

A. LABORATORY INFORMATION

1. Lab Overview

Degree:	BE	Program:	EC
Year / Semester :	3/6	Academic Year:	2019-20
Course Title:	Embedded controller Lab	Course Code:	17ECL67
Credit / L-T-P:	4 / 0-1-2	SEE Duration:	180 Minutes
Total Contact Hours:	42 Hrs	SEE Marks:	80 Marks
CIA Marks:	20	Assignment	
Course Plan Author:	Shilpa Rani P	Sign	Dt : 11/01/2019
Checked By:		Sign	Dt : 11/01/2019

2. Lab Content

Unit	Title of the Experiments	Lab	Concept	Blooms
		Hours		Level
	Conduct the following Study experiments to learn ALP using ARM			L4
	Cortex M3 Registers using an Evaluation board and the required software tool.			Analyze
1	ALP to multiply two 16 bit binary numbers.	3	multiplication	L4
2	ALP to find the sum of first 10 integer numbers.	3	addition	L4
	Conduct the following experiments on an ARM CORTEX M3 evaluation board using evaluation version of Embedded 'C' & Keil uVision-4 tool/compiler			L4
3	Display "Hello World" message using Internal UART.	3	UART initialization	
4	Interface and Control a DC Motor.	3	DC motor interface	L4
5	Interface a Stepper motor and rotate it in clockwise and anti- clockwise direction.	3	Stepper motor	L4
			interface	
6	Interface a DAC and generate Triangular and Square waveforms.	3	DAC	L4
7	Interface a 4x4 keyboard and display the key code on an LCD.	3	HEXA	L4
			Keypad	
8	Using the Internal PWM module of ARM controller generate PWM and vary its duty cycle.	3	PWM	L4
9	Demonstrate the use of an external interrupt to toggle an LED On/Off.		External interrupt	L4
10	Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.	3	7 segment interface	L4
11	Interface a simple Switch and display its status through Relay, Buzzer and LED.	3	Buzzer	L4
12	Measure Ambient temperature using a sensor and SPI ADC IC	3	ADC	L4

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3. Lab Material

Unit	Details	Available
1	Text books	
		In Lib
2	Reference books	
	Lab manual prepared by Department of E & C Engg, SKIT.	In dept
3	Others (Web, Video, Simulation, Notes etc.)	
		Not Available

4. Lab Prerequisites:

-	-	Base Course:		-	-
SNo	Course Code	Course Name	Topic / Description	Sem	Remarks
1					

Note: If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

5. General Instructions

SNo	Instructions	Remarks
1	Observation book and Lab record are compulsory.	
2	Students should report to the concerned lab as per the time table.	
3	After completion of the program, certification of the concerned staff in-charge in the observation book is necessary.	
4	Student should bring a notebook of 100 pages and should enter the readings /observations into the notebook while performing the experiment.	
5	The record of observations along with the detailed experimental procedure of the experiment in the Immediate last session should be submitted and certified staff member in-charge.	
6	Should attempt all problems / assignments given in the list session wise.	
7	It is responsibility to create a separate directory to store all the programs, so that nobody else can read or copy.	
8	When the experiment is completed, should disconnect the setup made by them, and should return all the components/instruments taken for the purpose.	
9	Any damage of the equipment or burn-out components will be viewed seriously either by putting penalty or by dismissing the total group of students from the lab for the semester/year	
10	Completed lab assignments should be submitted in the form of a Lab Record in which you have to write the algorithm, program code along with comments and output for various inputs given	

6. Lab Specific Instructions

SNo	Specific Instructions	Remarks
1	Turn on the computer.	

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2	Double click on Keil uVision-4 icon.	
3	Select new project in file menu.	
4	Enter the project name and location as shown below and hit Next.	
5	Select the Family, Device, Package and speed as per the requirements and hit Next.	
6	Create a new source by using new source icon or right click on the device/project	
	folder to create new source.	
7	Select the verilog module and enter the file name in New Source Wizard window and	
	hit Next.	
8	Enter the module name - dataflow/behavioral/structural, port name and select the	
	direction. This will create .v source file. Hit Next and finish the initial project creation.	
9	Write complete VHDL/Verilog code for implementation and save.	
10	Click on implementation and check for syntax using "Check syntax" option under	
	synthesize tab. If any error, edit and correct VHDL/Verilog code and repeat check	
	syntax until zero errors.	
11	Double click on ISIM simulator by selecting simulation mode to complete the	
	functional simulation of your design.	
12	Click on user constraints and select pre synthesis/post synthesis for assigning the	
	ports, select the ports and save. It will generate .ucf file to source file.	
13	Click on Implement design for checking Place, Route and Map.	
14	Click generate programming file to generate the .bit file for loading into FPGA kit.	
15	Select the COM port and load the bit file to FPGA kit and check the results.	
	Note down the results in observation book.	

B. OBE PARAMETERS

1. Lab / Course Outcomes

#	COs	Teach.	Concept	Instr	Assessment	Blooms'
		Hours		Method	Method	Level
17ECL67.1	Display "Hello World" message using	3	UART	Tutorial /	CIA	L2,L3
	Internal UART.			Demonstra		
				tipon/		
				Practical		
17ECL67.2	Interface and Control a DC Motor.	3	DC Motor	Tutorial /	CIA	L2,L3,
				Demonstra		L4,L5
				tipon/		
				Practical		
17ECL67.3	Interface a Stepper motor and rotate it in	3	Stepper	Tutorial /	CIA	L2,L3,
	clockwise and anti-clockwise direction.		motor	Demonstra		L4,L5
				tipon/		
				Practical		
17ECL67.4	Interface a DAC and generate Triangular	3	DAC	Tutorial /	CIA	L2,L3,
	and Square waveforms.			Demonstra		L4,L5
				tipon/		
				Practical		
17ECL67.5	Interface a 4x4 keyboard and display the	3	4x4	Tutorial /	CIA	L2,L3,
	key code on an LCD.		keyboard	Demonstra		L4,L5
				tipon/		
				Practical		
17ECL67.6	Using the Internal PWM module of ARM	3	PWM	Tutorial /	CIA	L2,L3,
	controller generate			Demonstra		L4,L5

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	A O All states as a second		

	DMM and yony its duty avala			tinon/		
	r www.and vary its duty cycle.					
				Practical		
17ECL67.7	Demonstrate the use of an external	3	external	Tutorial /	CIA	L2,L3,
	interrupt to toggle an LED On/Off.		interrupt	Demonstra		L4,L5
				tipon/		
				Practical		
17ECL67.8	Display the Hex digits 0 to F on a 7-	3	7-segment	Tutorial /	CIA	L2,L3,
	segment LED interface, with an		LED	Demonstra		L4,L5
	appropriate delay in between.		interface	tipon/		
				Practical		
17ECL67.9	Interface a simple Switch and display its	3	Relay,	Tutorial /	CIA	L2,L3,
	status through Relay, Buzzer and LED.		Buzzer and	Demonstra		L4,L5
			LED	tipon/		
				Practical		
17ECL67.1	Measure Ambient temperature using a	3	SPI ADC IC	Tutorial /	CIA	L2,L3,
0	sensor and SPI ADC IC			Demonstra		L4,L5
				tipon/		
				Practical		
-	Total	36	-	-	-	-

Note: Identify a max of 2 Concepts per unit. Write 1 CO per concept.

2. Lab Applications

SNo	Application Area	CO	Level
1	Memory controller.		L3
2	I/O controller		L3
3	Embedded system design for various applications		L3
4			L3
5			L3
6			L3

Note: Write 1 or 2 applications per CO.

3. Articulation Matrix

(CO - PO MAPPING)

-	Course Outcomes	Program Outcomes												
#	COs	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	Level
		1	2	3	4	5	6	7	8	9	10	11	12	
17ECL67.1	Display "Hello World" message	3	3	2		2				2			1	L4
	using Internal UART.													
17ECL67.2	Interface and Control a DC Motor.	3	3	2		2				2			1	L4
17ECL67.3	Interface a Stepper motor and	3	3	2		2				2			1	L4
	rotate it in clockwise and anti-													
	clockwise direction.													
17ECL67.4	Interface a DAC and generate	3	3	2		2				2			1	L4
	Triangular and Square waveforms.													
17ECL67.5	Interface a 4x4 keyboard and	3	3	2		2				2			1	L4
	display the key code on an LCD.													

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	3	3	2										
17ECL67.6	Using the	e Internal	PWM m	odule of	3	3	2	2		2		1	L4
	ARM controller generate												
	PWM and	d vary its	duty cycl	e.									
17ECL67.7	Demor	nstrate t	he use	of an	3	3	2	2		2		1	L4
	external	interrupt	to toggle	an LED									
	On/Off.												
17ECL67.8	Display t	he Hex o	ligits 0 to	F on a	3	3	2	2		2		1	L4
	7-segment LED interface, with an												
	appropria	ate delay	in betwee	en.									
17ECL67.9	Interface	a sim	ole Swit	ch and	3	3	2	2		2		1	L4
	display its status through Relay,												
	Buzzer a	nd LED.											
17ECL67.10	Measu	re Ambi	ent temp	perature	3	3	2	2		2		1	L4
	using a s	ensor an	d SPI AD	C IC									
17ECL67.	Average				3	3	2	2		2		1	L4

Note: Mention the mapping strength as 1, 2, or 3

4. Mapping Justification

Маррі	ng	Mapping	Justification
	_	Level	
со	PO	-	-
CO1	PO1	L4	The basic engineering knowledge is applied for the ARM programming.
CO1	PO2	L4	Performing experiment allows the easy analysis of problems.
CO1	PO3	L4	Designing a ARM based system to meet the specific needs within the
			realistic constraints can be done.
CO1	PO5	L4	Modern tools are used for designing and analysis of systems.
CO1	PO9	L4	Experiments are done in teams to develop team work.
CO1	PO12	L4	Practical knowledge inculcates inquisitiveness towards continuous learning.
CO2	PO1	L4	The basic engineering knowledge is applied for the ARM programming.
CO2	PO2	L4	Performing experiment allows the easy analysis of problems.
CO2	PO3	L4	Designing a ARM based system to meet the specific needs within the
			realistic constraints can be done.
CO2	PO5	L4	Modern tools are used for designing and analysis of systems.
CO2	PO9	L4	Experiments are done in teams to develop team work.
CO2	PO12	L4	Practical knowledge inculcates inquisitiveness towards continuous learning.
CO3	PO1	L4	The basic engineering knowledge is applied for the ARM programming.
CO3	PO2	L4	Performing experiment allows the easy analysis of problems.
CO3	PO3	L4	Designing a ARM based system to meet the specific needs within the
			realistic constraints can be done.
CO3	PO5	L4	Modern tools are used for designing and analysis of systems.
CO3	PO9	L4	Experiments are done in teams to develop team work.
CO3	PO12	L4	Practical knowledge inculcates inquisitiveness towards continuous learning.
CO4	PO1	L4	The basic engineering knowledge is applied for the ARM programming.
CO4	PO2	L4	Performing experiment allows the easy analysis of problems.
CO4	PO3	L4	Designing a ARM based system to meet the specific needs within the
			realistic constraints can be done.

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Copyright ©2017. cA/	AS. All rights re	served.	Modern tools are used for designing and an							
CO4	PO5	L4	Fynerimente are dens in teams to develop t	toom work						
C04	P09		Experiments are done in teams to develop							
C04	P012	L4		ss towards continuous learning.						
CO5	P01	L4	I he basic engineering knowledge is applied	for the ARM programming.						
CO5	PO2	L4	Performing experiment allows the easy ana	lysis of problems.						
CO5	PO3	L4	Designing a ARM based system to meet the	resigning a AKIVI based system to meet the specific needs within the						
CO5	PO5	14	Modern tools are used for designing and ar	alveis of systems						
CO5	PO0	1.4	Experiments are done in teams to develop t	toom work						
CO5			Experiments are done in teams to develop	eall work.						
005	P012	L4		ss towards continuous learning.						
C06	PUT	L4	I ne basic engineering knowledge is applied	tor the ARM programming.						
CO6	PO2	L4	Performing experiment allows the easy ana	lysis of problems.						
CO6	PO3	L4	Designing a ARM based system to meet the	e specific needs within the						
			realistic constraints can be done.							
CO6	PO5	L4	Modern tools are used for designing and ar	alysis of systems.						
CO6	PO9	L4	Experiments are done in teams to develop	ieam work.						
CO6	PO12	L4	Practical knowledge inculcates inquisitivene	ess towards continuous learning.						
CO7	PO1	L4	The basic engineering knowledge is applied	I for the ARM programming.						
CO7	PO2	L4	Performing experiment allows the easy ana	lysis of problems.						
CO7	PO3	L4	Designing a ARM based system to meet the	e specific needs within the						
			realistic constraints can be done.							
CO7	PO5	L4	Modern tools are used for designing and ar	alysis of systems.						
CO7	PO9	L4	Experiments are done in teams to develop	leam work.						
CO7	PO12	L4	Practical knowledge inculcates inquisitivene	ess towards continuous learning.						
CO8	PO1	L4	The basic engineering knowledge is applied	for the ARM programming.						
CO8	PO2	L4	Performing experiment allows the easy ana	lysis of problems.						
CO8	PO3	L4	Designing a ARM based system to meet the	e specific needs within the						
			realistic constraints can be done.							
CO8	PO5	L4	Modern tools are used for designing and ar	alysis of systems.						
CO8	PO9	L4	Experiments are done in teams to develop	team work.						
CO8	PO12	L4	Practical knowledge inculcates inquisitivene	ess towards continuous learning.						
CO9	PO1	L4	The basic engineering knowledge is applied	for the ARM programming.						
CO9	PO2	L4	Performing experiment allows the easy ana	lysis of problems.						
CO9	PO3	14	Designing a ARM based system to meet the	e specific needs within the						
		- ·	realistic constraints can be done.							
CO9	PO5	L4	Modern tools are used for designing and an	alvsis of systems.						
CO9	PO9	L4	Experiments are done in teams to develop	team work.						
CO9	PO12	14	Practical knowledge inculcates inquisitivene	ess towards continuous learning						
CO10	PO1	14	The basic engineering knowledge is applied	for the ARM programming						
CO10	PO2	14	Performing experiment allows the easy and	lysis of problems						
CO10	PO3	1/	Designing a ARM based system to meet the	a specific needs within the						
0010		L4	realistic constraints can be done							
CO10	PO5	11	Modern tools are used for designing and an	alvsis of systems						
CO10		1 /	Experiments are done in teams to douglast	team work						
0010	109	L4								

CO10PO12L4Practical knowledge inculcates inquisitiveness towards continuous learning.Note: Write justification for each CO-PO mapping.

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SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping					
1										
2										
3										
4										
5										

Note: Write Gap topics from A.4 and add others also.

6. Content Beyond Syllabus

SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Note: Anything not covered above is included here.

C. COURSE ASSESSMENT

1. Course Coverage

Unit	Title	Teachi		No	o. of qu	lestion	in Exa	am		CO	Levels
		ng	CIA-1	CIA-2	CIA-3	Asg-1	Asg-2	Asg-3	SEE		
		Hours									
1	ALP to multiply two 16 bit binary	03	1	-	-	-	-	-	1	CO1	L2
	numbers.										
2	ALP to find the sum of first 10	03	1	-	-	-	-	-	1	CO2	L3
	integer numbers.										
3	Display "Hello World" message	03	1	-	-	-	-	-	1	CO3	L3
	using Internal UART.										
4	Interface and Control a DC Motor.	03	1	-	-	-	-	-	1	CO4	L3
5	Interface a Stepper motor and rotate	03	1	-	-	-	-	-	1	CO5	L4
	it in clockwise and anti-clockwise										
	direction.										

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6	Interfa	ce a	DAC	and	gener	rate	03	1	-	-	-	-	-	1	CO6	L4	
	Iriang	ular and	d Squa	ire wav	etorm	s.											
7	7 Interface a 4x4 keyboard and display the key code on an LCD.				and	03	1	-	-	-	-	-	1	C07	L4		
8	Using ARM o vary its	Using the Internal PWM module of ARM controller generate PWM and vary its duty cycle.				e of and	03	-	1	-	-	-	-	1	CO8	L4	
9	Demonstrate the use of an external interrupt to toggle an LED On/Off.				rnal	03	-	1	-	-	-	-	1	CO9	L4		
10	Display segme	the H nt LE	ex digi D inte	ts 0 to rface,	F on a with	a 7- an	03	-	1	-	-	-	-	1	CO10	L4	

-	Total	42	7	8	5	5	5	5	20	-	-
	using a sensor and SPI ADC IC										
12	Measure Ambient temperature	03		1							
	Buzzer and LED.										
	display its status through Relay,										
11	Interface a simple Switch and	03	-	1	-	-	-	-	1	CO11	L4
	appropriate delay in between.										
	segment LED interface, with an										

Note: Write CO based on the theory course.

2. Continuous Internal Assessment (CIA)

Evaluation	Weightage in Marks	CO	Levels
CIA Exam – 1	30	CO1, CO2, CO3, CO4	L23, L3
CIA Exam – 2	30	CO5, CO6, CO7,CO8	L1, L2, L3
CIA Exam – 3	30	CO9,CO10,CO11	L1, L2, L3
Assignment - 1	05	CO1, CO2, CO3, CO4	L2, L3, L4
Assignment - 2	05	CO5, CO6, CO7,CO8	L1, L2, L3
Assignment - 3	05	CO9,CO10,CO11	L1, L2, L3
Seminar - 1	05	CO1, CO2, CO3, CO4	L2, L3, L4
Seminar - 2	05	CO5, CO6, CO7,CO8	L2, L3, L4
Seminar - 3	05	CO9,CO10,CO11	L2, L3, L4
Other Activities – define –		CO1 to CO11	L2, L3, L4
Slip test			
Final CIA Marks	40	-	-

SNo	Description	Marks
1	Observation and Weekly Laboratory Activities	05 Marks
2	Record Writing	10 Marks for each Expt
3	Internal Exam Assessment	20 Marks
4	Internal Assessment	5 Marks
5	SEE	600 Marks
-	Total	100 Marks

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D. EXPERIMENTS

Experiment 01 : ALP to multiply two 16 bit binary numbers.

-	Experiment No.:	1	Marks		Date		Date	
1	Title	\//ri	te verilog cod	le to realize al	Planned	tes	Conducted	
2	Course Outcomes	Cre abs	ate and ve tractions.	rify functiona	ality of vario	ous gates a	at the differ	ent level o
3	Aim	ALF	o to multiply t	wo 16 bit bina	ry numbers.			
4	Material / Equipment Required	Lab	Manual					
5	Theory, Formula, Principle, Concept							
6	Procedure, Program, Activity, Algorithm, Pseudo Code		 step 1: s step 2: v step 3: s step 4: c step 5: if step 6: s step 7: l step 8: s 	start write program save the prog check syntax f error then co imulate the de Hardware imp stop	ming ram rrect the erro esign lementation	ors		
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	P ; V V R R	rogram: //Program to AREA MU EXPORT main LDR R0, LDR R1, UMULL R LDR R7, STR R3, LDR R8, STR R4, ALUE1 DCD 64 ALUE2 DCD 64 AREA ESULT1 DCD ESULT2 DCD END	o multiply t LTIPLICATION main VALUE1 VALUE2 4, R3, R1, R =RESULT1 [R7] =RESULT2 [R8] BBBBBBBB 22222222 DATA2, DATA, R 0X0 0X0	wo 32-bit o ;Read t ;Read t ;Read t ;Read t ;Read t ;Store ;Read t ;Store ;Store	data ADONLY the first data the second data oly R0 with R1, s the address the contents of R the address the contents of R	tore the result in 3 into address po 4 into address po	R3 and R4 binted by R7 binted by R8
8	Observation Table, Look-up Table, Output		•					

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10	Graphs,	Outputs	Image: Second State of the second s	rk\praveen.uvproj - µVision4
11	Results	& Analysis	•	
12	Applicat	ion Areas	•	
13	Remark	S		
14	Faculty	Signature with		
	Date			

Experiment 02: ALP to find the sum of first 10 integer numbers.

-	Experiment No.:	1	Marks	Da	te	Date				
				Plan	ned	Conducted				
1	Title ALP to find the sum of first 10 integer numbers.									
2	Course Outcomes									
3	Aim	ALF	P to find the s	um of first 10 intege	r numbers.					
4	Material / EquipmentLab Manual									
	Required									

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8	ANGALORE	Title:	Course Lab Manual	Page: 12 / 28
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Principle, Concept		Formula, e, Concept	<pre>Program: ;//program to add two 64 bit numbers AREA SUMARRAY, CODE, READONLY EXPORTmain main LDR R0, =VALUE1 ;Read the address LDR R1, [R0] ;Load the data at the address R0 into R1 LDR R2, [R0, #4] ;Load the data at the address into R2 LDR R0, =VALUE2 ;Read the address LDR R3, [R0] ;Load the data at the address R0 into R3 LDR R4, [R0, #4] ;Load the data at the address into R4 ADDS R6, R2, R4 ;Add the contents of R2 and R4 store the re ADC R5, R1, R3 ;Add with carry the contents of R1 and R3 LDR R0, =RESULT ;Read the address STR R5, [R0] ;Store the contents of R5 to address pointed STR R6, [R0, #4] ;Store the contents of R6 to address pointed VALUE1 DCD &BBBBBBBB, &AAAAAAAA VALUE2 DCD &CCCCCCCC, &FFFFFFF AREA ADDITION, DATA, READWRITE RESULT DCD &0 END</pre>	esult in R6 store the result in R5 i by R0 i by R0+4
6	Procedu Activity, Pseudo	ire, Program, Algorithm, Code	•	
			•	
7	Block, (Diagram Equation Graph	Circuit, Model n, Reaction n, Expected		
8	Observa Look-up Output	ation Table, Table,	, ,	
9	Sample	Calculations	• -	

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Copyright ©2017. cAAS. All rights reserved.			File Edit View Proj File Edit View Proj Register File Core File Register Rog File File Register Rog File File R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R13 (SP) R14 (LR) R13 (SP) R14 (SP) R14 (SP) R15 (PC) BeySR Banked Bods Proviege Firstemal Mods Proviege Registers Memory Wind Registers Registers	ject Flash Debug Peripher	als Tools SVCS Window H Also Tools SVCS Window H Also Tools SVCS Window H Is I I I I I I I I I I I I I I I I I I	C:\Keil\ARM\Examples leip //2 0 //2 0 //		raveen.u	vproj		on4
			Memory 1 Address: 0X1000	0000							
			0x10000000: 0x10000017: 0x1000002E: 0x1000002E: 0x10000045: 0x1000005: 0x100005: 0x100005: 0x100005: 0x100000000000000000000000000000000000	88 88 88 88 88 A9 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	AA AA AA 00 00 0 00 00 00 00 00 0 00 00 00 00 00	0 00 00 00 00 00 0 0 00 00 00 00 0 0 00 0	୦୦୦୦ ୦୦୦୦ ୦୦୦୦ ୬୦୦୦ ୫୦୫୫ ଏ	00 00 00 00 00 00 00 00	00 00 00 00	00 00 00 00 00 00)0 00 00 00
			PSR Status:	D1	D1	D2	7 1	7 6	C		
			VALUE2	0x11111111	0xCCCCCCCC	0xDDDDDDD D					
11	Results	& Analysis	• Mes	sage "Hello W	orld" appearing	g for 5 times in	n hyp	erter	mi	nal.	
12	Applicat	ion Areas	•	~		C	<u> </u>				
13	Remark	s									
14	Faculty Date	Signature with	1								

Experiment 03: Display "Hello World" message using Internal UART.

-	Experiment No.:	1	Marks		Date		Date	
					Planned		Conducted	
1	Title	Dis	play "Hello W	/orld" messag	e using Inter	nal UART.		
2	Course Outcomes							
3	Aim	Dis	play "Hello W	/orld" messag	e using Inter	nal UART.		
4	Material / Equipment Required	Lab	Lab Manual					
5	Theory, Formula, Principle, Concept							
6	Procedure, Program,	,	• Algorith	nm:				
	Activity, Algorithm,		1. Creat	te a project a	nd include the	e above progr	ram using Ke	il tool.
	Pseudo Code		2. Creat	te a Hex file a	ind build.			
			• 3. Flash	the program	onto the chip	o using Flashl	Magic softwa	re.
			4.Check	k the message	e transmitted	in hyperterm	inal.	
			Step 1: register	Configure 1	he GPIO pi	n for UART() function us	sing PINSEL
			• Step 2:	Configure th	e FCR for e	enabling the I	FIXO and Re	este both the



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	Look-up	Table,		
	Output			
9	Sample	Calculations	• -	
10	Graphs,	Output		
1	1 Results & Analysis		Message "Hello World" appearing for 5 times	in hyperterminal.
12	Applicat	ion Areas	Embedded systems.	
13	Remark	S		
14	Faculty	Signature with		
	Date			

Experiment 04: Interface and Control a stepper Motor.

-	Experiment No.:	4	Marks		Date Planned		Date Conducted		
1	Title	Inter	face and Co	ntrol a steppe	Motor.				
2	Course Outcomes								
3	Aim	Inter	face and Co	ntrol a steppe	⁻ Motor.				
4	Material / Equipment Required	Lab	Manual						
5	Theory, Formula, Principle, Concept	Inter	face and Co	ntrol a steppe	Motor.				
6	Procedure, Activity,,	,	 Procedu 	ire:					
	Pseudo Code		 1. Creat 	1. Create a project and include the above program using Keil tool.					
			 2. Creat 	e a Hex file ar	nd build.				
			 3. Flash 	the program of	onto the chip usi	ng Flashl	Magic softwa	re.	
			 4. Chec 	k the wave in a	a CRO.				
	Algorithm		 Algorith 	im:					
			 1. Confi 	gure the functi	onality of p2.0-p	2.3 as ge	eneral IO.		
			 2. Confi 	gure the p2.0-	p2.3 as output p	ort.			
			 3. Call 	continuously t	he function to r	otate clo	ckwise and a	anticlockwise	
			with					delay.	
			Clockwi	se rotation:					
			 1. Initial 	ize a variable	with initial excita	tion value	e 0x0000000	1.	
			 2. Clear 	the four port b	oits and apply the	e excitatio	on.		
			 3. Rotat 	e the pattern le	eft by one-bit po	sition.			
			 4. Repe 	at the step 3 a	nd 4 continuous	ly to attai	n the require	d angle.	
			 5. For a 	nticlockwise ro	tate the pattern	right.			



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	SRI KRIS		Doc C	ode:	EC.SKIT.Ph5b1.F03	Date: 18-08-2019
* 84	Title:	e:	Course Lab Manual	Page: 17 / 28		
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	8	Observa	ation	Table,	•	

0		
	Look-up Table,	
	Output	
9	Sample Calculations	• -
10	Graphs, Outputs	
11	Results & Analysis	•
12	Application Areas	•
13	Remarks	
14	Faculty Signature with	
	Date	

Experiment 05: Interface a DAC and generate Triangular and Square waveforms.

-	Experiment No.:	5	Marks		Date Planned		Date Conducted	
1	Title	Inte	rface a DAC	and generate	Triangular a	nd Square wa	aveforms.	
2	Course Outcomes			<u> </u>				
3	Aim	Inte	rface a DAC	and generate	Triangular a	and Square wa	aveforms.	
4	Material / Equipment	l ab	Manual	<u>generate</u>				
	Required							
5	Theory, Formula,						Ant	•
	Principle, Concept						001	-
			From LPC176	58 74нс	Г244	,	0400800	To CRO
			P0.4 to P0.11 Octal Buffer P0.4 to P0.11 DACOBOO TO ENCO					
					/er			
								→
							GND	
6	Procedure, Program,		Algorith	im for genera	ting triangul	lar wave:		
	Activity, Algorithm,		• 1. Confi	gure the port	pins as GPI0	D.		
	Pseudo Code		 2. Make 	the configure	ed port pins a	as output.		
			 3. Defin 	e a loop and	keep incren	nenting the va	ariable and s	end the data
			out thro	ugh the port p	bins to DAC.			
			• 4. Define another loop and keep decrementing the variable and send the					
			ata out through the same port pins to DAC.					
			 S.Repeat from step 4 infinite time, so as to generate the wave continuously. 					
			Algorithm for generating square wave:					
			 1. Start 					
			 2. Confi 	gure the port	pins as GPIC	D.		
			• 3. Make	the configure	ed port pins a	as output.		
			• 4. Make	all the port p	in high. 5. In:	sert a delay		
			• 6. Make	all the port p	in low.	-		
		• 7. Insert a delay. 8. Repeat from step 4 infinite time, so as to generate						
			the wave continuously.					
			• Procedu	ire:				
			• 1. Creat	e a project ar	nd include the	e above progr	am using Ke	il tool.
			• 2. Crea	te a Hex file a	and build.			
			• 3. Flash	the program	onto the chip	o using Flashl	vlagic softwa	re.
			• 4. Chec	k the wave in	a CRO.			

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**	ANGALORE*	Title:	Course Lab Manual	Page: 18 / 28
Copyrig 7	bht ©2017. cÅ Block, (Diagram Equation Graph	AS. All rights reserve Circuit, Moc n, Reactio n, Expecto	<pre>d. fl Program to generate triangular wave: #include <lpc17xx.h> int main () {unsignedinti=0; //global declaration LPC_PINCON->PINSEL0=0x0000000; //Configure port pins P0.4 LPC_GPI00->FIODIR =0x00000FF0; //Make port pins P0.4 to P while(1) //Define an infinite loop to generate the triangular wave contin { for (i=0; i!=0xFF; i++) //keep incrementing the value 'i' untill it reaches the { LPC_GPI00->FIOPIN=(i<<4); //left shift 'i' 4 times so as to bring the data to p } for (i=0xFF; i!=0; i) //decrement the value 'i' untill it reaches the mir { LPC_GPI00->FIOPIN=(i<<4); //left shift 'i' 4 times to bring the data to seco } //End of while(1) //End of main //End of main</lpc17xx.h></pre>	to P0.11 as GPIO 0.11 as output pins uously max value port pins P0.4 to P0.11 1 value and nibble
			<pre>Program to generate Square wave: #include <lpc17xx.h> unsigned inti=0; //global decla int main () { LPC_PINCON->PINSEL0 = 0x00000000; //Configure P LPC_GPI00->FIODIR =0x00000FF0; //make port pins P0.4 while(1) //define an inf { LPC_GPI00->FIOSET=0x00000FF0; //make all the port pin for(i=0; i<=9500; i++); //Delay LPC_GPI00->FIOCLR=0x00000FF0; //make all the port pin for(i=0; i<=9500; i++); //Delay } //end of while }</lpc17xx.h></pre>	aration 0.4 to P0.11 as GPIO to P0.11 as output finite loop ns P0.4 to P0.11 high ns P0.4 to P0.11 high e(1) function
8	Observa	ation Tab	e, •	
	Output			
9	Sample	Calculations	• -	
10	Graphs,	Outputs		
11	Results	& Analysis	Triangular wave displayed on CRO.	
			Square wave displayed on CRO	
12	Applicat	ion Areas	•	
13	Remark	s		
14	Faculty	Signature w	th	
	Date			

Experiment 07: Interface a 4x4 keyboard and display the key code on an LCD.

-	Experiment No.:	1	Marks		Date		Date		
					Planned		Conducted		
1	Title	Inte	erface a 4x4 keyboard and display the key code on an LCD.						
2	Course Outcomes	Inte	terface a 4x4 keyboard and display the key code on an LCD.						
3	Aim	Inte	erface a 4x4 k	keyboard and	display the k	ey code on a	n LCD.		
4	Material / Equipment	Lab	Manual						
	Required								
5	Theory, Formula,	,							
	Principle, Concept								

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6	Procedu Activity, Pseudo	ire, Program Algorithm Code	 Procedure: 1. Create a project and include the above program us 2. Create a Hex file and build. 3. Flash the program onto the chip using FlashMagic 4. Check the key pressed on the LCD display. 	sing Keil tool. software.
7	Block, (Diagram Equation Graph	Circuit, Mode n, Reaction n, Expected	<pre>#include<lpc1 xx.h=""> #include"lcd.h" voidscan(void); unsigned char Msg1[14] = "SKIT unsigned char Msg2[13] = "KEY unsigned char row, KEY_PRES unsigned long int i, row_val unsigned char SCAN_CODE {0x1E,0x1D,0x1B,0x17, 0x2E,0x2D,0x2B,0x27, 0x4E,0x4D,0x4B,0x47, 0x8E,0x8D,0x8B,0x87}; unsigned char ASCII_CODE[16] = {'0' '4','5','6','7',</lpc1></pre>	<pre>BENGALURU"; PRESSED="; SSED, key; , col_val; [16] = ,'1','2','3',</pre>

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'8','9','A','B',	
'C','D','E','F'};	
int main(void)	
{	
LPC PINCON->PINSEL3 &= 0xFFFF00FF; //P1.20	to
P1.23 MADE GP	IO
LPC PINCON->PINSELO $\&= 0 \times 3 \times 7 \times 7$	τO
(last bit of first balf wor	41
$I DC DINCON-NDINGEI 1 G = 0 VEEEEEECO \cdot //DO 16$	+
DO 19 made CDIO (first 2 bits of second balf yer	20
IDC CDIOL > FIODID = 0000070000 //meda Imm	(ג ב
$LPC_GPIOU = >FIODIR &= ~OX00078000; //made Inpl$	JL
P0.15 to P0.18 (col:	5)
LPC_GPIO1->FIODIR = 0x00F00000; //made outpu	Jt
P1.20 to P1.23 (rows	з)
LPC_GPIO1->FIOSET = 0x00F0000);
<pre>lcd_init();</pre>	
temp1 = 0x80; //point to first line of L(CD
<pre>lcd com();</pre>	
delav lcd(800);	
lcd puts($&Msg1[0]$); //display the message RI	NS
BENGALURU	
temp1 = $0xC0$; //point to second line of L(CD
lcd com();	
delay lcd(800);	
lcd puts (&Msg2[0]): //display the message Ki	ΞY
PRESSED=	
rkessed-	
While(1)	
<pre>for(row=1;row<5;row++)</pre>	
if(row ==	1)
row val = 0x0010000);
else if(row ==	2)
row val = 0x0020000);
else if(row ==	3)
$r_{OW} v_{A} = 0 x 0.040000$	n •
= if(row) = =	1)
	±)
$LPC_GPIOI ->FIOSET = 0X00F00000$	J;
$LPC_GPIOI->FIOCLR = row_va.$	⊥;
	J;
scan();	
if(KEY_PRESSED ==	1)
break;	
} //ei	nd
<pre>for(row=1;row<5;row++)</pre>	
if(KEY PRESSED ==	1)
break;	

and and		SK	KIT		Teaching Process		Rev No.: 1.0
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				}	//2nd		while(1)
				for(i=0;i<16;	i++)		
				{			
				if(key	==		SCAN CODE[i])
				{			—
				kev	=	А	SCII CODE[i];
				break:			,
				} //end	if(key	==	SCAN CODE[1])
) // Cilia	//end	for($i = 0 \cdot i < 16 \cdot i + 1$
				tomol		101 (
					_		UXCC,
				1 c d c c c c ();	\		
);		
				LCa_puts(&key);		-
				}	//end	while	1
				}	//end		main
				void			scan(void)
				{			
				unsigned	long		<pre>col_val;</pre>
				col val	=	LPC G	PIOO->FIOPIN;
				col val	~=	_	0x00078000;
				if(col val !	$= 0 \times 00078000)$	// if	key pressed
				-			
				for(i=0;i<500	;i++); //	Debour	nce delav
				col val	=	LPC G	PTO0->FTOPTN:
				col val	ج&=		0x00078000:
				if(col val l=	= 0×00078000) /	/ confirm	key pressed
				aftor	dobouno		valob valob
					debound	C	ueray
				ן תהסהתת אהא	- 1. // kou	nr	ia confirmed
				REI_FRESSED	-1, // Key	fress .	
				COI_VAI >>- I	J; //COL_VAL SH	filed to	come at lower
				, eraaru		lirst	byte
				row_val >>=	16; //row_val	sniited	to come at
				higher	nibble of	tır	st byte
				key	=	COL	_val row_val;
				} //2nd	lf(col_val	!=	0x00000000)
				} //1 :	st if(col_va	1 !=	0x0000000)
				} //end scan			
8	Observa	ition	Table,	•			
	Look-up		Table,				
	Output						
9	Sample	Calcula	ations	• -			
10	Graphs.	Output	t				
11	Results	& Anal	ysis	All the keys c	on the hex keypad were d	isplayed on the	LCD screen.
12	Applicat	ion Are	as	•		,	
13	Remark	s	-				
1/	Faculty	- Sianati	Ire with				
'-	Date	orginall					

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Experiment 08: Using the Internal PWM module of ARM controller generate PWM and vary its duty cycle.

-	Experiment No.:	8	Marks		Date		Date	
1	Title	Usi	ng the Interr	nal PWM m	nodule of AR	V controller ge	enerate PWN	I and vary its
		duty	y cycle.					
2	Course Outcomes	Usii dut <u>y</u>	ng the Interr y cycle.	nal PWM m	nodule of AR	A controller ge	enerate PWN	1 and vary its
3	Aim	Usii dutv	ng the Interr v cycle.	nal PWM m	nodule of AR	A controller ge	enerate PWN	1 and vary its
4	Material / Equipment Required	Lab	Manual					
5	Theory, Formula, Principle, Concept		PWM	P WM 2	O/P JP10 PIN MALE BE	RG YELLOV R69 RESI	R36 479 W LED STOR	₹~
6	Procedure, Program, Activity, Algorithm, Pseudo Code		 Step1: Step2: Step3: PWM a Step4: interrup Step5: dictates Step6: determ 100,200 Step7: Step8: enable 	Set bit 6 of Configure F Program F and enable of Program N of for the ma Set up a r s the upper Initialize Mf ines the Detc.). Program La Program Ti PWM.	PCONP regis PINSEL7 to se PWM Control output. Match Control atch register f match count limit of termir R2 (match re incremental atch enable re imer Control	eter to set PWN et P3.25 for PV Register (PC I Register (MC PWMMR0. in MR0(match al count. gister 2). The steps (i.e gister (LER) to Register (TCR	A power on. VM1.2 R) to enable CR) to rese register 0). count value increase o enable all the to set/rese	e single edge and set the This register in the register n steps o he latches. t counter and
			 Algorit 1. Prog 2. Initia 3. Initia 4. Incres 5. Go b 6. End. 	hm: gram the ne lize the terr lize the incr ement the co pack to step	ecessary regis minal count in remental cour ount in accord 3 if terminal c	ters for the pe a register. It in a register. lance wit the v ount is reache	ripheral. alue set in S d.	tep3.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	#i: vo	nclude < id pwm_i id PWM1_ int ma {	LPC17xx nit(voi IRQHand ain(void	(.H> Ld); ller(voic d)	.);		

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			<pre>pwm_init();</pre>	
			while(1);	
			} //end of main	
			yoid num init (woid)	
			LPC_SC->PCONP = (1<<6); //PWM1 is pow	vered
			LPC PINCON->PINSEL7 = 0x000C0000);
			_	
			$I_{PC} PWM1 - > PCR = 0 \times 00000400$:	
			I DC DWM1 > MCD = 0.00000002.	
			$\frac{1}{1} \frac{1}{1} \frac{1}$	
			LPC_PWMI->MR0 = 30000; //setup matc	ch register0
			LPC_PWM1->MR2 = 0x00000100;	
			LPC PWM1->LER = 0x000000FF; //ena	able shadow
			vqoo	//register
			$I_{PC} PWM1 - > TCR = 0 \times 0.0000002 : //RES$	SET COUNTER
				//DDECCALED
				//FRESCALER
			$ LPC_PWMI->TCR = 0x0000009; //enab$	le PWM and
			counter	
			NVIC EnableIRQ(PWM1 IRQn);	
			return;	
			}	
			woid DWM1 TROH	landler (void)
			LPC_PWMI->IR = 0xii; //reset the	Interrupts
			if(LPC_PWM1->MR2<27000)	
			{	
			LPC PWM1->MR2+=100; //Increases	the Duty
			cvcle //at every	match
			if (IPC DWM1-	->MR2>=27000)
				/MIX2/=2/000)
			LPC_PWM1->MR2=100; //If mr2 reaches	27000 //the
			mr2 is rolled to	o 100
			}	
			}	
			IDC DWM1 NIED - 0.000000EE. //Em	abling Tatab
			$\frac{1}{2} = \frac{1}{2} = \frac{1}$	abiling Laten
			register	
			} //to copy new MR2 Value.	
8	Observa	ation Table	 Truth table verification 	
	Look-up	Table, Output		
9	Sample	Calculations	• -	
10	Granhe	Outputo		
10	Grapris,			
11	Results	& Analysis	•	
12	Applicat	ion Areas	•	
13	Remark	S		
14	Faculty	Signature with		
' '	Date	elgilatore with		

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Experiment 09 : Demonstrate the use of an external interrupt to toggle an LED On/Off.

1 2 3 4		9	Marks		Date		Date			
1 2 3 4					Planned		Conducted			
2 3 4 5	Title	Write v	verilog coo	le to realize a	II the logic ga	ites				
3	Course Outcomes	Create	and ve	rify functiona	ality of vario	ous gates a	at the different	ent level	of	
3 4 5		abstra	ctions.							
4	Aim	Write \	/erilog co	de to realize	all the logic g	jates in beha	vioural, dataf	low and g	ate	
4		level m	nodeling.							
5	Material / Equipment	tLab Ma	anual							
5	Required									
Ŭ	Theory, Formula	,								
	Principle, Concept		ا ما ما ما ما							
6	Procedure, Program Activity, Algorithm	•	1. Conf	i m: igure the pins	as external i	nterrupts in P	INSELx regis	ter.		
	Pseudo Code	•	2. Clear	any pending	interrupts in	EXTINT.	-			
		•	3. Conf	gure the EIN	Tx as Edge/L	evel triggered	in EXTMOD	E register	.	
		•	4. Sele	ect the polar	ity (Falling/R	ising Edge,	Active Low/	High) of	the	
			interrup	t in EXTPOL	AR register.					
		•	5. Fina	lly enable the	e interrupts b	y calling NV	IC_EnableIR	Q() with I	RQ	
			number							
7	Block, Circuit, Mode				- I DC	3.3V				
	Diagram, Reaction	1	EX	r INT3 fo	r LPC176	s Ţ	R21			
	Equation, Expected				JP6	. <u>}</u>	SW2			
	Graph		EINT	2	PIN MALE B	ERG	SJIT REY			
							0.1uF			
					R 39	L2	÷	- ·		
					2K3	~~		з∨		
						LED				
		Pro	arem							
		#in	nclude <lp< th=""><th>C17xx.h></th><th></th><th></th><th></th><th></th><th></th></lp<>	C17xx.h>						
		vo: int	id EINT3_ t main(vo	lRQHandler(v id)	old);					
		{	LPC PT	NCON->PINSEL	$4 = 0 \times 04000$	000. //E	22 13 as FINT3			
			LPC_PI	NCON->PINSEL	$4 \&= 0 \times FCFFF$	'FFF; //I	2.12 GPIO for LI	ED		
			LPC_GP LPC_GP	IO2->FIODIR IO2->FIOSET	$= 0 \times 00001000 \\= 0 \times 00001000$; //F ; //I	2.12 is assigned on the second	output t on		
			LPC_SC	->EXTINT = 0	x00000008; //	writing 1 clr the i	nt, get set if there	is int.		
			LPC_SC LPC_SC	->EXTMODE = ->EXTPOLAR =	0x00000008; 0x00000000;	<pre>//EINT3 is initiat //EINT3 is fallin</pre>	ed as edge senitive	e		
			NVIC_EnableIRQ(EINT3_IRQn); //core_cm3.h							
			while(1);	T3_IRQn);	//core_cm	3.h			
		} vo: {	while(id EINT3_	IRQHandler(v	T3_IRQn); oid)	//core_cm	.3.h			
		} vo: { }	while(id EINT3_ LPC_SC LPC_GP	IRQHandler(v ->EXTINT = 0 IO2->FIOPIN	T3_IRQn); oid) x00000008; ^= 0x0000100	//core_cm	//cleares the	interrupt		
8	Observation Table	} vo: { }	while(id EINT3_ LPC_SC LPC_GP Truth tal	<pre>line control (control control con</pre>	T3_IRQn); oid) x00000008; ^= 0x0000100	//core_cm	//cleares the	interrupt		
8	Observation Table	} vo: { }	while(id EINT3_ LPC_SC LPC_GP Truth tal	<pre>IRQHandler(v ->EXTINT = 0 IO2->FIOPIN Dle verification</pre>	T3_IRQn); oid) x00000008; ^= 0x0000100]	//core_cm 0;	//cleares the	interrupt		
8	Observation Table Look-up Table Output	} vo: { }	while(id EINT3_ LPC_SC LPC_GP Truth tal	<pre>Displaying (EIN 1); IRQHandler(v ->EXTINT = 0 102->FIOPIN Die verification</pre>	T3_IRQn); oid) x00000008; ^= 0x0000100]	//core_cm 0;	//cleares the	interrupt		
8	Observation Table Look-up Table Output Sample Calculations	} vo: { }	while(id EINT3_ LPC_SC LPC_GP Truth tal	<pre>Distance (); IRQHandler(v ->EXTINT = 0 IO2->FIOPIN Die verification</pre>	T3_IRQn); oid) x00000008; ^= 0x0000100	//core_cm 0;	//cleares the	interrupt		
8 9 10	Observation Table Look-up Table Output Sample Calculations Graphs, Output	} vo: { }	while(id EINT3_ LPC_SC LPC_GP Truth tal	1); IRQHandler(v ->EXTINT = 0 IO2->FIOPIN Dle verification	T3_IRQn); oid) x00000008; ^= 0x0000100]	//core_cm 0;	//cleares the	interrupt		
		Pro #i1 vo in1 {	gram: nclude <lp id EINT3_ t main(vo LPC_PI LPC_PI LPC_GP LPC_GP LPC_SC LPC_SC LPC_SC NVIC_E</lp 	C17xx.h> IRQHandler(v id) NCON->PINSEL NCON->PINSEL IO2->FIODIR IO2->FIOSET ->EXTINT = 0 ->EXTINT = 0 ->EXTMODE = ->EXTPOLAR =	<pre>oid); 4 = 0x04000 4 &= 0xFCFFF = 0x00001000 = 0x00001000 x00000008; // 0x00000008; 0x00000008;</pre>	0000; //F FFFF; //F ; //I ; //I writing 1 clr the i //EINT3 is initiat //EINT3 is fallin	22.13 as EINT3 22.12 GPIO for LI 22.12 is assigned on initiall LED is kep nt, get set if there ed as edge sensitive age dge sensitive	ED putput t on is int. e		

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* BA	NGALORE*	Title:	Course Lab Manual	Page: 25 / 28
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12	Applicat	ion Areas	•	
13	3 Remarks			
14	4 Faculty Signature with			
	Date			

Experiment 10: Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.

-	Experiment No.:	10 Marks		Date		Date		
				Planned		Conducted		
1	Title	Display the He	ex digits 0	to F on a	7-segment	LED interfa	ice, with	an
2	Course Outcomes	Display the He	ex digits 0	to F on a	7-segment	LED interfa	ce, with	an
		appropriate dela	y in between.					
3	Aim	Display the He	ex digits 0	to F on a	7-segment	LED interfa	ce, with	an
1	Matorial / Equipmont	appropriate dela	y in between.					
4	Required							
5	Theory, Formula,	Basic structure	of programmi	ng in verilog,	Logical expr	ession and T	ruth table	e for
	Principle, Concept	all the logic gate	S.		· ·			
6	Procedure, Program, Activity, Algorithm, Pseudo Code	 Algoritl 1. Start 2. Prep 3. Conf 4. Conf and P0 5. Enab 6. Clea with del 7. If the 8. Othe continu 9. End. 	are the lookup igure the Pins igure P0.4-p0 20 (enable pi le the two Dis r the P0.4-P0 ay. count is not e erwise initiali ously.	p table for sev sel0 and pinse 0.11(data lines ins for seven s splays. 0.11 and send equal to 10h(ize the cour	ven segment el1 for genera s for seven se segment) as d the seven-s 16) repeat ste nt to zero a	display. Il I/O. egment displa output pin. segment code ep 6. and repeat	ay) and P(e one by step 5 to	0.19 one o 7
	Diagram, Reaction Equation, Expected Graph		*PB0 *PB1 4 13 *PB2 6 133 *PB2 6 133 *PB3 11 241 *PB6 115 233 *PB7 17 244 *PB7 19 24 *PB7 74H	1 1/1 18 1 1/3 16 1 1/3 1/4 1 1/3 1/4 2 1/1 9 2 1/1 9 2 2/1 9			SEG A B SEG C SEG C SEG D SEG E SEG E SEG G G DP1	
		<pre>#include unsigned unsigned 0x000005b0 0x000004f0 0x00000070 0x000007f0 0x00000390</pre>	int dela int Dia , 0x00 , 0x00	ay, cour sp[16]={(000660,0 0006f0,	nt=0, Sw Dx000003: x000006d 0x0000	<lf vitchcour f0, 0x0 0, 0x0 0770,0x0</lf 	2C17xx. ht=0, 00000000 000007c	.h> j; 50, 40,

and a second		SKIT	Teaching Process	Rev No.: 1.0
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			UXUUUUUSEU, UXUUUUU/90,	UXUUUUU/10};
			#deline ALLDISP 0x00100000 //Select al	T display by
			Holding DATA DODT ON OUODOffo //DO 4 to	p0.20
			#deline DATAPORI 0x00000110 //P0.4 co	PU.II : Dala
			int main	(void)
				(VOIU)
			LPC PINCON->PINSEL0 =	0×0000000.
			LPC PINCON->PINSEL1 =	0×00000000;
			LPC GPIO0->FIODIR =	0x00180ff0;
			while(1)	011001001001100,
			{	
			LPC GPIOO->FIOSET =	ALLDISP;
			LPC GPIO0->FIOCLR =0x00000ff0; //clea	ar the data
			lines to 7-segment	displays
			LPC_GPIO0->FIOSET=Disp[Switchcount]; /	//get the 7-
			seg display value from t	che array
			<pre>for(delay=0;delay<300000;delay++); //</pre>	′ 1s delay
			Switchcount++;	
			if (Switchcount == $0x10$) // 0 to	F has been
			displayed ? go back	to 0
			Switchcount =	0;
			LPC_GPIOU->FIOCLR=UXUUI8UIIU;	
-	Ohaamaa	Kan Tabla	}	
8	Observa	ition Table	2	
	LOOK-UP	Table	3	
0	Sampla	Coloulationa		
9	Graphs			
10	Bosulto	& Analysis	•	
12	Annlicati	ion Areas	•	
13	Remarke	2		
14	Faculty	- Signature with	<u>ا</u>	
	Date			
	Build			

Experiment 11 : Interface a simple Switch and display its status through Relay, Buzzer and LED.

-	Experiment No.:	11	Marks	Date	Date	
				Planned	Conducted	
1	Title					
2	Course Outcomes					
3	Aim					
4	Material / Equipment	Lab	Manual			
	Required					
5	Theory, Formula					
	Principle, Concept					
6	Procedure, Program		Algorithm:			
	Activity, Algorithm,		• 1. Start			

SKIT			Teaching Process	Rev No.: 1.0		
SRI KRIS		Doc C	Code:	EC.SKI	T.Ph5b1.F03	Date: 18-08-2019
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	Pseudo	Code		•	2. Configure the pin for general IO.	
				•	3. Configure the pin as output port.	
				•	4. Check if the switch is pressed, if yes turn on the bu	zzer and relay.
				•	5. Introduce some delay	
				•	6. Turn off the buzzer and relay.	
				•	7. End	
7	Block, (Circuit,	Model			
	Diagram	ı, R	eaction		CN5 RELAY × 11 013	
	Equatior	n, Ex	pected			
	Graph				FED LED(3mm) GOODSKY RELAY	
					BUZZER SV BUZZER	
					P0.24 BUZZ H64 12E 2	
				•	#include	<lpc17xx.h></lpc17xx.h>
					unsigned int	count=0;
					int	main(void)
					{	
					unsigned int	i;
					LPC PINCON->PINSEL1 = 0x00000	00; //P0.24
					AND P0.25	GPIO
					LPC GPIO0->FIODIR = 0×0.3000000 ;	//P0.24 AND
					P0.25	output
					while(1)	
					{	
					if(!(LPC_GPTO2->FTOPTN&	0×00000800))
						011000000000,,
					$f_{0r}(i=0.i<10.i++)$	
					I_{PC} GPTO0->FIOSET = 0x03000000:	//relay on
					for(i=0:i<10000:i++):	,,reidy on
					{	
					I_{PC} GPTOD->FIOCLE = 0x03000000	//relay off
						,,,1010g 011
					for(i=0:i<100000:i++):	
					} //end int	main (void)
					}	
Q	Observe	ation	Table	•	,	
0			Table,	-		
			i abie,			
0		0.1.1.1.				
9	Sample		ations	•		
10	Graphs,		IS 			
11	Results	& Analy	ysis	•		
12	Applicat	ion Are	as	•		
13	Remark	S				
14	Faculty	Signatu	ire with			
	Date					

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