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COURSE PLAN

Academic Year FEB 2020

Program:	B E – Computer Science & Engineering
Semester :	4
Course Code:	18CSL48
Course Title:	MICROCONTROLLER AND EMBEDDED SYSTEM LAB
Credit / L-T-P:	2 / 0-0-2
Total Contact Hours:	36
Course Plan Author:	AMINA

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Academic Evaluation and Monitoring Cell

No. 29, Chimney hills, Hesaraghatta Road, Chikkabanavara BANGALORE-5600990, KARNATAKA, INDIA Phone / Fax :+91-08023721315/23721477 www.skit.org.in

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

18CSL48 : MICROCONTROLLER AND EMBEDDED SYSTEMS LAB

A. LABORATORY INFORMATION

1. Lab Overview

Degree:	BE	Program:	CS
Year / Semester :	2/4	Academic Year:	2018-19
CourseTitle:	Microcontroller and Embedded Systems lab	Course Code:	18CSL48
Credit / L-T-P:	2 / 1-0-2	SEE Duration:	180 Minutes
Total Contact Hours:	40 Hrs	SEE Marks:	60Marks
CIA Marks:	40	Assignment	1 / Module
Course Plan Author:	Prof. VINAY KUMAR B C	Sign	Dt :
Checked By:		Sign	Dt :

2. Lab Content

EXPT	Title of the Experiments		Concept	Blooms
		Hours		Level
1	Write a program to multiply two 16 bit binary numbers.	03	ALP	L4

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	oopylight ezerr. cAAo: Air lights reserved.			
				Analyze
2	Write a program to find the sum of first 10 integer numbers.	03	ALP	L4
				Analyze
3	Write a program to find factorial of a number.	03	ALP	L4
				Analyze
4	Write a program to add an array of 16 bit numbers and store the 32	03	ALP	L4
	bit result in internal RAM			Analyze
5	Write a program to add an array of 16 bit numbers and store the 32	03	Interrupt	L4
	bit result in internal RAM		Functions	Analyze
6	Write a program to find the largest/smallest number in an array of	03	ARM ALP	L4
	32 numbers		&C	Analyze
7	Write a program to arrange a series of 32 bit numbers in			
	ascending/descending order			
8	Write a program to count the number of ones and zeros in two			
	consecutive memory locations			
	To write and simulate C Programs for ARM microprocessor using	03	ARM ALP	L4
	KEIL (Demonstrate with the help of a suitable program)		&C	Analyze
9	Display "Hello World" message using Internal UART	03	1/0	L4
			Interfacing	Analyze
10	Interface and Control a DC Motor	03	1/0	L4
	Interface a Stepper motor and rotate it in clockwise and anti-		Interfacing	Analyze
	clockwise direction.			
11	Determine Digital output for a given Analog input using Internal	03	/0	L4
	ADC of ARM controller.		Interfacing	Analyze
	Interface a DAC and generate Triangular and Square waveforms.			
12	Interface a 4x4 keyboard and display the key code on an LCD	03	/0	L4
			Interfacing	Analyze
13	Interface a 4x4 keyboard and display the key code on an LCD On/	03	ARM	L4
	Off.		Interface	Analyze
14	Display the Hex digits 0 to F on a 7-segment LED interface, with	03	ARM	L4
	an appropriate delay in between		Interface	Analyze

3. Lab Material

Unit	Details	Available
1	Text books	
		In Lib
2	Reference books	
		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

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1	18CSL	.48	Microcon	troller and		2	
			Embedde	ed System			
			Lab				
						2	
			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/Software Programs 8086	Remarks					
1	Open DOS editor to create file						
2	Use KEIL tool to Assemble , debug and execute file						
	Specific Instructions/Software Programs ARM						
1	Use KEIL tool to Assemble , debug and execute file						
	Specific Instructions/Hardware Programs 8086						
1	Open DOS editor to create file						
2	Use KEIL tool to Assemble , debug and execute file						
3	Do connections as per interface diagram						
4	Test results						
	Specific Instructions/Hardware Programs ARM						

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1	1 Use KEIL tool to Assemble , debug and execute file							
2	Do co							
3	Test results							

B. OBE PARAMETERS

1. Lab / Course Outcomes

#	COs	Teach.	Concept	Instr	Assessment	Blooms'
		Hours		Method	Method	Level
1	Develop and test program using	24	ALP	Instructi	Slip Test	L2
	ARM7TDMI/LPC2148			ons		
				&Demo		
				nstration		
2	Conduct the following experiments on an	16	INTERFACIN	Instructi	Slip Test	L3
	ARM7TDMI/LPC2148 evaluation board		G	ons	-	
	using evaluation version of Embedded 'C'			&Demo		
	& Keil Uvision-4 tool/compiler			nstration		
-	Total	39	-	-	-	-

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

2. Lab Applications

SNo	Application Area	CO	Level
1	Assembly language programming is required to develop system programs	CO1	L2
2	Interrupt Functions is required to formulate system program solutions	CO1	L2
3	ARM AL and 'C' programming is required to develop embedded systems.	CO2	L3
4	ARM programming for interfacing external devices is used design and develop	CO2	L3
	embedded systems.		

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	
18CSl48.1	Develop and test program using	3	2	3		3								2
	ARM7TDMI/LPC2148													
18CSl48.2	Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision- 4 tool/compiler.	3	2	3		3						2	2	3

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

4. Mapping Justification

Mappir	ng	Mapping	Justification
		Level	
СО	PO	-	-

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CO1	PO1	3	Knowledge of assembly language programming is	required to develop
			system programs	
CO1	PO2	2	Knowledge of assembly language programming is	s useful in analyzing
			system programs	, 3
CO1	PO3	3	Assembly language programs used to design a	and develop system
		-	programs	, ,
CO1	PO5	3	Assembler tool used to learn Assembly language pro	ogramming
CO2	PO1	3	Knowledge of Interrupt Functions is required to deve	lop system programs
CO2	PO2	2	Interrupt Functions is required to formulate system p	rogram solutions
CO2	PO3	3	Interrupt Functions are used to design and develops	system programs
CO2	PO5	3	Interrupt Functions help in development of system p	program projects
CO2	PO11	2	Learning in the context of technology changes	
CO2	PO12	3	ARM programming for interfacing external device	s is used design and
			develop embedded systems.	

Note: Write justification for each CO-PO mapping.

5. Curricular Gap and Content

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.

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C. COURSE ASSESSMENT

1. Course Coverage

Unit	Title	Teachi		No	o. of qu	estior	n in Exa	am		СО	Levels
		ng	CIA-1	CIA-2	CIA-3	Asg-1	Asg-2	Asg-3	SEE		
		Hours									
1	ALP for 16 Bit addition	03	1	-	-	-	-	-	1	CO1	
2	ALP for first addition of ten	03	1	-	-	-	-	-	1	CO1	
	numbers	02	1						1	CO1	
3	ALP for add an array of 16 bit	03	1	-	-	-	-	-	1	CO1	
4	numbers	03	-						T	001	
5	ALP to square of a number (1 to 10)	03	-	1	-	-	-	-	1	CO1	
	using look-up table.										
	Write a program to count the	h									
	number of ones and zeros in two										
6	Largest/smallest number in an array	03	_	1	-	_	-	-	1	C:O1	
	of 32 numbers	03		-					1	001	
	or 32 humbers										
	in according (descending order										
7	ADM C programs	02	_	1	_	_	_		1	CO_2	
8	ARM C programs	03	_	1		_	_	_	1	CO_2	
	Display Helio World Message	03		1					T	002	
0	Using Internal OART.	02	_	_	1	_	_	_	1	CO_2	
9	Analog input using Internal ADC of	. 03			-				1	002	
	Analog input using internal ADC of										
10	interface stepper motor	02	_		1			_	1	CO_2	
10	Interface and Control a DC Motor	03			-				T	002	
11		03	_	_	1	_	_	-	1	C02	
11	Display the Hey digits 0 to E on a 7-	03			-				1	002	
	cognont LED interface with an										
	appropriate delay in between										
12	interface LCD on/off	03	_	_	1	_	_	_	1	CO2	
12	Interface 20 01/01	02	_	_	1	_	_	_	1	CO2	
<u>د ا</u>	display the key sode on an LCD	03							т	002	
	Total	20	4	4	E				12		
<u> </u>		22	4	4	5		L		±3	-	

Note: Write CO based on the theory course.

2. Continuous Internal Assessment (CIA)

Evaluation	Weightage in Marks	СО	Levels	
CIA Exam – 1	25	CO1	L2	
CIA Exam – 2	25	CO1	L2	
CIA Exam – 3	25	CO1,CO2	L3	
record	15			

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Final C	IA 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	25 Marks
4	Internal Assessment	40 Marks
5	SEE	60 Marks
-	Total	100 Marks

D. EXPERIMENTS

Experiment 01 :

-	Experiment No.:	1 Marks	Date		Date	
			Planned		Conducted	
1	Title	ALP for 16 Bit	addition			
2	Course Outcomes	Able to develo	p ARM Assembly languag	je program fo	or addition	
3	Aim	Write a progra	m to multiply two 16 bit b	nary numbe	rs.	
4	Material / Equipment Required	1. Designing to	ol software KEIL			
5	Theory, Formula, Principle, Concept	,				
6	Procedure, Program, Activity, Algorithm, Pseudo Code1	AREA M ENTRY LDR R(LDRH R UDRH R MUL R3 STOP B STOP NUM DC	Iultiply, CODE, READONLY 0, =NUM ; load address of m R1, [R0] ; load First number 2, [R0,#2] ; load Second num 3, R1, R2 ; R3 = R1 x R2 ; all done 2W 0X1222,0X1133 ; Decla	ultiplicand nber ration of no's	to be multiply	
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	L 1 1				
8	Observation Table,	,				
	Look-up Table, Output					
9	Sample Calculations					
10	Graphs, Outputs					

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		B WI	
		Register Value	
		R0 0x00000010 R1 0x00001222 R2 0x00001133 R3 0x0137DEC6 R4 0x0000000 R5 0x0000000 R6 0x0000000 R7 0x0000000 R8 0x0000000 R9 0x0000000 R11 0x0000000 R12 0x0000000 R13 (SP) 0x0000000 R14 (LR) 0x0000000 R15 (PC) 0x0000000 Past Interrupt Interrupt Interrupt Supervisor Abort Undefined	
11	Results &Analysis		
12	Application Areas	Assembly language programming is required to c	ievelop system programs
13	Remarks		
14	Date		

Experiment 02 :

-	Experiment No.:	2	Marks		Date Planned		Date Conducted	
1	Title	first a	addition of te	n numbers				
2	Course Outcomes	Able	to develop A	RM Assembl	y language p	rogramfor a	ddition first te	en numbers
3	Aim 1.	Writ	Write a program to find the sum of first 10 integer numbers.					ers.
4	Material / Equipment Required	desi	gning tool so	ftware keil				
5	Theory, Formula, Principle, Concept	Able	to develop A	RM Assembl	y language p	rogram		
6	Procedure,	ARE	A ADD1TO10	, CODE, REAL	ONLY ENTRY			
	Program, Activity,		MOV R	.1,#10	;len	gth of array		
	Algorithm, Pseudo Code		LDR R	2,=ARRAY	;Loa	d the startin	ng address o	f the array
			MOV R	4,#0	;Init	ial sum		

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			Copyright ©2017. cAAS. All rights reserved.	
			NEXT LDR R3,[R2],#4 ;Load first integer of	the
			array in R3 ADD R4,R4,R3 ;R4=sum of integers	
			SUBS R1,R1,#1	
			BNE NEXT	
			;repeat until R1=0 STOP B STOP	
			ARRAY DCD	
			1.2.3.4	
			5678	
			9 10	
			END	
7	Block, Model Reactic Expecte	Circuit, Diagram, n Equation, ed Graph		
8	Observ Look-u	ation Table, p Table,		
	Output	<u>, </u>		
9	Calcula	tions		
10	Graphs	Outputs		
11	Results	&Analysis		
12	Applica	tion Areas	Assembly language programming is required to develop sys	tem programs
13	Remark	(S		
14	Faculty	Signature		
-	with Da			

Experiment 03 :

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Planned Conduct	ted
1 Title Factorial of a number	ΔΙ
3 Aim 2. Write a program to find factorial of a number.	
4 Material /1. Designing tool software KEIL	
Required	
5 Theory, Formula, Able to develop ARM Assembly language program	
6 Procedure, AREA Factorial, CODE, READONLY	
Program, Activity, ENTRY	
Code MOV R0,#4 ; load the number in R0	
CMP R0,#0 ; check if the number is 0	
BEQ ANS ; if number is 0, go to label ANS	S
CMP R0,#1 ; check if the number is 1	
BEQ ANS ; If number is 1, go to label ANS MOV B1 B0 ; Conv the number in B1	5
$\frac{1}{100} \text{ MOV R1, R0}, \text{ Copy the number in R1}$	
in R1 till 0 BEO STOP \cdot if yes store	
factorial value	
MUL $R2,R1,R0$; if not fact= $R0 \times R1$	
MOV R0,R2 ; move fact value	
B UP	
;repeat until R1 is 0 ANS	
MOV R0,#1	
STOP B STOP ; Stop	
7 Block, Circuit, Model Diagram	
Reaction Equation,	
Expected Graph 8 Observation Table	
Look-up Table, Register Value	-
Output Current B0 0x00000018	
Calculations	
10 Graphs, Outputs R3 Cx0000000	
R5 Qx00000000	
R6 0x00000000 R7 0x00000000	
R8 0x0000000 R9 0x0000000	
R10 0x0000000 R11 0x0000000	
R12 0x0000000 R13 (SP) 0x0000000	
CS R14 (LR) 0x0000000 R15 (PC) 0x00000034	
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11 Resi	ults &Analysis		
	-		
12 App	lication Areas	Assembly language programming is required to	o develop system programs
13 Rem	arks		
14 Facu	ılty Signature		
with	Date		

Experiment 04 :

-	Experiment No.:	4	Marks		Date		Date	
-	T:+1 -				Planned		Conducted	
1	Title	add	an array o	f 16 bit nun	nbers			
2	Course Outcomes		to develop A	RM Assembl	y language p	orogram		
3		wr	ite a prog	ram to ad	a an array		numbers	and
		stc	ore the 32 b	it result in	internal RA	AМ		
	Matarial			ofturioria I/EII				
4	Fauinment	1. Des	signing tools	oitware KEIL				
	Required							
5	Theory, Formula,							
	Principle, Concept							
6	Procedure,	ARE	A ADDITION,	CODE,READOI	NLY ENTRY			
	Program, Activity,		MOV R	5,#6	;length of a	rray		
	Code		MOV R	0,#0	;initial sum			
			LDR R1	I,=VALUE1	;sta	rting		
		add	lress of the a	rray LOOP	LDRH R2,[R1],#2		
					;R2	=first		
		ele	ment of array	у				
			ADD R	0,R0,R2	;add first el	ement with		
			initial su	um SUBS R	5,R5,#1			
			BNE LO	OOP	;repeat add	ition		
			until r5=	=0 LDR R4,=	=RESULT			
			STR R0	,[R4]	;sto	re		
		the	result in me	mory STOP	B STOP			
		VA	LUE1 D	CW				
			0X1111	,0X2222,0X	3333,0X444	44,0X3333		
			,0X5555	5 AREA				
			DATA2	,DATA,REA	ADWRITE			
		RESU	LT DCD 0X0 E	ND				

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7	Block, Model Reaction Expecte Observa	Circuit, Diagram, n Equation, d Graph ition Table,		
	Look-up Output	o Table,		
9	Sample Calculat	ions		
10	Graphs,	Outputs		
			Memory 1	
			Address: 0x40000000	
			0x40000000: 32 33 01 00 00 00 00 00 00 00 00	00 00 00
			0x400000D: 00 00 00 00 00 00 00 00 00 00 00 00	00 00 00
			0x4000001A: 00 00 00 00 00 00 00 00 00 00 00 00 00	00 00 00
			0x40000041: 00 00 00 00 00 00 00 00 00 00 00 00	
			0x4000004E: 00 00 00 00 00 00 00 00 00 00 00 00	00 00 00
			0x4000005B: 00 00 00 00 00 00 00 00 00 00 00 00	00 00 00
			0x40000068: 00 00 00 00 00 00 00 00 00 00 00 00	00 00 00
				<u> </u>
			Call Stack + Locals Memory 1	
11	Results	&Analysis		
12	Applicat	ion Areas	Assembly language programming is required to develop sys	tem programs
13	Remark	S		
14	Faculty with Dat	Signature e		

Experiment 05 :

-	Experiment No.:	5	Marks		Date		Date	
					Planned		Conducted	
1	Title	squ	square of a number (1 to 10) using look-up table.					
2	Course Outcomes	Able	ble to develop ARM Assembly language program using LOOKUP TABLE					
3	Aim	Wri	Write a program to find the square of a number (1 to 10) using					
		look	-up table.					
4	Material /	1. Des	signing tool s	oftware KEIL				
	Equipment							
	Required							
5	Theory, Formula	,						
	Principle, Concept							

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			1	Copyright ©2017. cAAS. All rights r	reserved.		
6	Procedu	ire,	AREA square, Co	ODE, READONLY ENTR	ΥY		
	Program	n, Activity	MOV	R1,#0X3	; load the number to	o be squared	
	Algorith	m, Pseudo	LDR	R0,=LOOKUP	; load the starting a	ddress of the looku	p table
	Couc		MOV	R1,R1,LSL#0X2	; offset of value to	be squared	
			ADD	R0,R0,R1	; points to mem wh	ere square of the gi	ven no is so
			LDR	R3.[R0]	: load the squared y	alue from look-up	table
			STOP B	STOP	, I	1	
				LOOKUP	DCD		
			0X0,0X1,0x	4,0x9,0x10,0x19,0x	x24,0x31,0x40,0x51,0x6	54	
					; look-up table		
			Е				
			Ν				
			D				

6	era P	SKIT	Teaching	g Process	Rev No.: 1.	.0
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		Title:	Course Plan		Page: 17 / 3	30
		0' ''	Copyright ©2017. cAAS. All	rights reserved.		
7 8 9	Block, Model Reactior Expecte Observa Look-up Output Sample Calculat	Circuit, Diagram, Equation, <u>d Graph</u> tion Table, Table, ions		Register Current R0 R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 (SP) R14 (LR) R15 (PC) SPSR SPSR SPSR Super/System Interupt Abort Undefined	Value ▲ 0x00000040 0x0000028 0x0000000 0x0000000 0x0000000 0x0000000	
10	Graphs,	Outputs				
11	Results	&Analysis				
13	Remarks	6	nterrupt Functions is required to	o formulate system	program solutions	
14	Faculty	Signature			· •	
	with Dat	е				

Experiment 06 :

-	Experiment No.:	6	Marks	Date		Date		
				Planned		Conducted		
1	Title	largest/smallest number in an array of 32 numbers.						

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		Code:				2018
		Title:	Course	e Plan		Page: 18 / 30
2	Course	Outcomes	Able to sir	Copyright ©2017. cA4 mulate ARM asse rations	^{IS. All rights reserved.} mbly language for data trar	nsfer, arithmetic and
3	Aim	3.	Write a pro numbers.	ogram to find the	largest/smallest number in an	array of 32
4	Material Equipm Require	ent d	1. Designing	g tool software KE	IL	
5	Theory, Principle	Formula, e, Concept				
6	Procedu Program Algorith Code	n, Activity, m, Pseudo	A E M L a a LOOP L o 1 M NEXT S c STOP B	AREALARGE,CO ENTRY IOV R5,#5 DR R1,=ARRAY ddressing of array Tray DR R4,[R1],#4 f array CMP R2,I st and 2nd elemen IOV R2,R4 UBS R5,R5,#1 omparison BNE I STOP	DDE,READONLY ;R5 = length of array - 1 7; load starting 7 LDR R2,[R1],#4 ;load 1st element of ;load next element R4 ;compare nt BHI NEXT ;R2=largest value ;decrement the counter afte LOOP ; repeat until R5=0	r every
			ARRAY		DCD	
			0	X23,0X45,0X65,	0X76	
			,()X12,0X99		
7	Block.	Circuit.	END			
	Model Reaction Expecte	Diagram, n Equation, ed Graph				
	Observa Look-up Output	ation Table, Table,				
	Sample Calculat	ions				
10	Graphs,	Outputs				

6	and a	SKIT	Teaching	Process		Rev No.: 1.0
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			Copyright ©2017. cAAS. All ri	ghts reserved.		
				Registers	-	4 🔛
				Register	Value	<u>▲</u>
				RO	0x0000000	0
					0x0000004	14 19
				R3	0x0000000	0
					0x0000009	9
				<mark>R5</mark>	0x000000	0
				R6	0x000000	0
				R7	0x000000	0
					0x000000	0
				R9	0x0000000	0
				RIU P11	0x0000000	0
				B12	0×0000000	0
				B13 (SP)	0x0000000	0
				R14 (LR)	0x0000000	0
				R15 (PC)	0x0000002	8
				⊡ CPSR	0x600000)3
					0x000000	0
				'±' User/Svstem		
11	Results	&Analysis				
		,				
12	Applicat	ion Areas	ARM AL and 'C' programming is re	equired to develop	o embedde	d systems.
13	Remark	S				
14	Faculty	Signature				
	with Dat	e				

Experiment 07 :

-	Experiment No.:	7	Mai	rks			Date	е				Date		
							Plann	ed			Con	ducte	d	
1	Title	Arra	nge a s	series	of 32	bit nı	umbers in	asce	ending/	desce	endir	ig orde	er.	
2	Course Outcomes	Able arith	e to sir Imetic	nulate and lo	e ARM ogical	1 ass oper	embly lan ations	igua	ige and	'C'pro	ograr	ns for	data trans	sfer,
3	Aim	Writ asce	e a ending,	prog /desc	ıram endin	to g orc	arrange ler.	а	series	of	32	bit	numbers	in
4	Material /	1. D	esignir	ng too	l softv	vare	KEIL.							
	Equipment Required													
5	Theory, Formula,													
	Principle, Concept													
6	Procedure, Program,				ARE	EA A	scending,							
	Activity, Algorithm,				COL	DE,	U,							
	Pseudo Code													

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6	SKIT			Teaching Proc	ess	Rev No.: 1.0
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			LOOP0 of dest array NOSWP STOP SVALUE DATA1,DA DVALUE	Copyright ©2017. cAAS. All rights reserv READONLY ENTRY MOV R8,#4 ;Lengtl LDR R2,=SVALUE source array LDR R address of the destin LDR R1,[R2],#4 source ary to dest ar MOV R7,#3 ;R7=Number of pass I MOV R5,R7 ;R5=Number of comp LDR R1,=DVALUE in R1 NXTCMP LDR R3,[R1] CMP R2,R3 ;Comp array BLT NOSWP swapping STR R2,[R1],#-4 of the array STR R3 ADD R1,R1,#4 SUBS R5,R5,#1 counter by 1 till 0 BI SUBS R7,R7,#1 counter by 1 till 0 BI SUBS R7,R7,#1 counter by 1 till 0 BI SUBS R7,R7,#1 counter by 1 till 0 BI SUBS R7,R7,#1 COD 0X44,0X11,0X3 AREA TA,READWRITE DCD 0X00 END	ed. h of the array C;Starting address of 3,=DVALUE ;Star hation array ;Loop0 copies all th y STR R1,[R3],#4 NXTPAS varisons E ;Loads the s LDR R2,[R1 ares first and second ;If first element is st ;Swaps the elements ,[R1] ;Decrement compar NE NXTCMP ;Decrement pass NE NXTPAS 33,0X22	the ting e elements of tarting address 1],#4 element of the maller, no s ison
7	Block, C Diagram Equation	nrcuit, Model n, Reaction n, Expected				
	Graph					
8	Observa Look-up	ition Table, Table,				
	Output	Coloulations				
9 10	Sample Graphs	Calculations Outputs				
10	Graphs,	Outputs				

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6	e A	SKIT	Teaching	Rev No.: 1.0	
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			Copyright ©2017. cAAS. Al	rights reserved.	
			Memory 1	Memory 2	
			Address: Dx00000064	Address: (bx40000000	
			0x00000064: 44 00 00 00 11 00 00 00 33 00 00 0x00000073: 00 64 00 00 00 00 00 00 40 00 00	00 22 00 00 00 00 00 0x400000000000000000000000000000000000	0 00 22 00 00 00 33 00 00 00 44 00 00 00 00 00 00 00 00 00 00 00
			0x00000082: 00 00 00 00 00 00 00 00 00 00 00 00 0x00000091: 00 00 00 00 00 00 00 00 00 00 00 00	00 00 00 00 00 0x4000001A: 00 00 00 00 00 00 0x40000027: 00 00	00 00 00 00 00 00 00 00 00 00 00 00 00
			0x000000A0: 00 00 00 00 00 00 00 00 00 00 00 00 0	00 00 00 00 00 0x40000034: 00 00 00 00 00 00 0x40000041: 00 00	JO 00 00 00 00 00 00 00 00 00 00 00 JO 00 00 00 00 00 00 00 00 00 00
			V000000BE: 00 00 00 00 00 00 00 00 00 00 00 00 00	00 00 00 00 00 0x4000004E: 00 00 00 00 00 00 0x4000005B: 00 00	JO OO OO JO OO
			A <mark>0x00000DC: 00 00 00 00 00 00 00 00 00 00 00 00 00</mark>	00 00 00 00 v 00x40000068: 00 00	00 00 00 00 00 00 00 00 00 00 00 🔻
11	Results	&Analysis			
12	Applicat	tion Areas	ARM AL and 'C' programming i	s required to develop e	nbedded systems.
13 14	Remarks Faculty with Dat	s Signature æ			

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PART B

Experiment 09:

-	Experiment No.:	8a	Marks		Date		Date	
					Planned		Conducted	
1	1 itle 1.	Displa	y "Hello	World" me	ssage usir	ng Internal	UART.	
2	Course Outcomes	Able to	Design a	and develop	ARM prog	grams to inte	erface with	external I/O
	A in a	devices						
3	Aim 2.	Displa	y "Hello	World" me	ssage usir	ng Internal	UARI.	
4	Material /							
	Equipment							
5	Theory Formula							
	Principle, Concept							
6	Procedure,	#incluc	le <lpc214< th=""><th>x.h></th><th></th><th></th><th></th><th></th></lpc214<>	x.h>				
	Program, Activity,	void						
	Algorithm, Pseudo	uart i	ntorrunt((biov				
	Code			1				
		irq ; u	insigned c	enar				
		temp	, temp1 =					
		0x00	; unsigned	£				
		char r	x flag = 0	Ο,				
		tx fla	$\sigma = 0$.	,				
		<u>"_</u> "	Θ °,					
		- ,	• (• 1)					
		int ma	ain(void)					
		{						
		PINS	EL0=0X0	000005;	//se	elect TXD0 a	and RXD0 li	nes
		U0LC	CR = 0X0	0000083;	//er	hable baud ra	ate	
		diviso	or loading	and U0DLM	1 = 0X00:	//select 1	the	
		data f	òrmat		,			
		U0DI	$L = 0x1^2$	5	//se	lect		

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6	e a P	SKIT	Teaching Process	Rev No.: 1.0
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			Copyright ©2017. cAAS. All rights reserved.	
			U0IER = 0X03 //select Transmit and	Recieve interrupt
			VICVectAddr0 = (unsigned long)uart_interrupt;	//UART 0
			INTERRUPT VICVectCntl0 = $0x20 6;$	// Assign the
			VIC channel uart-0 to interrupt priority 0	
			VICIntEnable = 0x00000040; // Enable the uart-0 in while(1)	nterrupt
			while $(rx_liag = 0x00)$; // wait for receive flag to set ry flag = $0x00$; // clear the	
			flag	
			U0THR = temp1;	
			while(tx flag == $0x00$); //wait for	
			transmit flag to set tx_flag = $0x00$; //clear	
			the flag	
			}	
			}	
			void uart_interrupt(void)_irq	
			{	
			temp = U0IIR;	
			temp = temp & 0x06; //check bits, data sending or receivin	g
			sending via UARTO VICVectAddr=0.	
			,	
			else if(temp == $0x04$) // check any data available t	to receive
			{	
			// U0THR = U0RBR;	
			emp1 = UURBR; // copy data into variable	
			$\pi_{1} = 0$ π_{1} , π_{1} set π_{2} to indicate that data is received VICVect $\Delta ddr=0$.	
			}	
7	Block, Model	Circuit, Diagram		

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(Cong	SKIT	Teaching Process	Rev No.: 1.0				
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Doaction	n Equation						

	Reaction Equation,	
	Expected Graph	
	Observation Table	
	Look-up Table	
	Output	
	Sample	
	Calculations	
10	Graphs, Outputs	
11	Results &Analysis	
12	Application Areas	ALP to interface with external I/O devices is used to design interfacing solutions
		of computers with external devices
13	Remarks	
14	Faculty Signature	
	with Date	

Experiment 10:

-	Experiment No.:	10	Marks		Date Planned		Date Conducted	
1	Title	Interf	ace and Con	trol a DC Mo	tor.		conducted	
2	Course Outcomes	Able I/O d	ole to Design and develop ARM assembly programs to interface with external O devices					
3	Aim	Interf	ace and Con	trol a DC Mo	tor			
4	Material / Equipment Required							
5	Principle, Concept							
6	Procedure, Program, Activity, Algorithm, Pseudo Code	<pre>#in clu de <lp 14="" c2="" x.h=""> voi d clo ck w</lp></pre>						

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6	e all	SKIT	Teaching Process	Rev No.: 1.0
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			Copyright ©2017. cAAS. All rights reserved.	
			ise	
			id):	
			void	
			anti clo	
			ck wise	
			(void);	
			unsigne	
			d int	
			j=0;	
			int main()	
			{	
			PINSEL2 = 0XFFFFFF0;	
			//IO1CLR = 0X0000ff00;	
			IO1DIR= 0X00030000; //p1.16	and
			p1.1/ are selected as outputs. IOISE1=	1:-1
			0X00010000; //P1.16 should always	nign.
			while(1)	
			{	
			<pre>clock_wise();</pre>	
			for(j=0;j<500000;j++); //delay	
			anti clock wise();	
			for(j=0;j<500000;j++); //delay	
			} //End of while	(1)
			} //End o	f Main
			<pre>void clock_wise(void) {</pre>	
			for($i=0$: $i<500000$: $i++$)://small delay to allo	w motor to turn off
			IO1SET = 0X00030000; //Selecting the P1	.17 line for clockwise
			and turn on motor	
			}	
			void anti clock wise(void)	

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6	e a P	SKIT	Teaching Process	Rev No.: 1.0
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	-		Copyright ©2017. cAAS. All rights reserved.	
			{	
			IO1CLR = 0X00030000; relay	//stop motor and also turn off
			for(j=0;j<1000000;j++); turn off	//small delay to allow motor to
			IO1SET = 0X00010000; Anti clockwise	//not selecting the P1.17 line for
			}	
7	Block,	Circuit,		
	Model	Diagram,		
	Fynecte	i Equation, d Graph		
8	Observa	ition Table,		
	Look-up	o Table,		
	Output			
9	Sample Calculat	ions		
10	Graphs	Outputs		
11	Results	&Analysis		
		,		
12	Applicat	ion Areas	8086 ALP to interface with external I/O dev solutions of computers with external devices	vices is used to design interfacing
13	Remarks	S		
14	Faculty with Dat	Signature e		

Experiment 11:

-	Experiment No.:	11 Marks		Date Planned		Date Conducted	
1	Title	Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.					
2	Course Outcomes	Able to Design ar I/O devices	nd develop 80	86assembly	/ programs t	to interface \	with external
3	Aim	Interface a	Stepper m	otor and	rotate it i	in clockwi	se and

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6	00 AD	SKIT	Teaching Process	Rev No.: 1.0
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			anti-clockwise direction.	
4	Material	. /		
	Equipm	ent d		
5	Theory,	Formula,		
6	Principle Procedu	e, Concept Ire	#include <1 PC21xx hs void clock wise(void)	
	Program	n, Activity,	void	
	Algorith Code	m, Pseudo	anti_cloc	
	couc		k_wise(v	
			oid) ;	
			unsigned	
			int var1;	
			unsigned long int $I = 0$, $J = 0$, $K = 0$;	
			int main(void)	
			{	
			PINSEL2 = $0x00000000;$ //P1.20 to P1.23 GPI	0
			IO1DIR = 0x00F00000 ; //P1.20 to P1.23 mad	e as output
			while(1)	
			{	
			for $(i = 0 \cdot i < 50 \cdot i + 1)$ // 50 times in Clock	
			wise Rotation clock wise(): // rotate one	
			round clockwise	
			IO1CLR =0x00F00000 ;	
			//clearing all 4 bits while(1);	,
			tor($k = 0$; $k < 65000$; $k++$); // Dela	iy to
			snow anti_clock Rotation $10f(j=0; j < 30; j++)$ times in Anti Clock wise Rotation anti-clock wise	// 50
			// rotate one round	c (),
			anticlockwise	
			for($k = 0$; $k < 65000$; $k++$); // Delay to she	ow ANTI_clock
			Rotation	_
			``````````````````````````````````````	
			}	
			// End of main	

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1	(Per all	SKIT	Teaching Process	Rev No.: 1.0
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7	Block.	Circuit.		
'	Model	Diagram.		
	Reactio	n Equation.		
	Expecte	ed Graph		
	Lipcou	a arapir		
8	Observa	ation Table,		

8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	
11	Results &Analysis	
12	Application Areas	interface with external I/O devices is used to design interfacing solutions of computers with external devices
13	Remarks	
14	Faculty Signature	
	with Date	

# Experiment 12: .....

			N4 . J .		Dili		Data	
-	Experiment No.:	12	Marks		Date		Date	
					Planned		Conducted	
1	Title	Detei	rmine Digital	output for a	a given Anal	og input usi	ng Internal A	ADC of ARM
		contr	oller.					
2	Course Outcomes	Able	to Design ar	nd develop 8	086assembl	y programs	to interface v	with external
		1/0 d	levices					
3	Aim							
		Detei	rmine Digital	output for a	given Analog	g input using	g Internal AD	C of
		ARM	controller.					
4	Material /	·						
	Equipment							
	Required							
5	Theory, Formula,							
	Principle, Concept							
6	Procedure,	#include <lpc214x.h> #include <stdio.h></stdio.h></lpc214x.h>						
	Program, Activity,	#define vol 3.3 //						
	Algorithm, Pseudo Reference voltage #define							
	Code	£.11	coole 0x2ff	0				
		1011	scale 0x311					

6	PAR	SKIT	Teaching Pr	ocess	Rev No.: 1.0
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			Copyright ©2017. cAAS. All rights re	served.	
			//10 bit adc fullscale		
			unsigned int		
			data $lcd=0,i=0,n=0;$		
			unsigned int		
			adc_value=0,temp_adc=0,temp1,t	emp2,	
			adc[8]; float temp,adc1[8];		
			unsigned char var[15],var1[15],fst_flag	=0xff; unsigned char *ptr	;arr[]= "ADC O/P= ";
			unsigned char *ptr1,dis[]="A I/P = "; <b>N</b>	t(void); void w	/r_cn(void);
		1	void clr_disp(void);		
			void		
			delay		
			int main()		
			PINSEL1 = 0X04000000	; , 	
			//ADU.2	pin is	
			selected IOODIR = 0x000000FC	, iro o/n	
			lines for led	ure o/p	
			lines for fed		
			delay(3200);		
			lcd_init();	//LCD initializ	zation
			delay(3200);		
			clr_disp();	//clear display	,
			delay(3200);	//delay	
			ptr = dis;	//Display starting add	nona of lat
			$\lim_{n \to \infty} \cos L CD \log \cos(n)$	//Display starting add	ress of 1st
			delay(800):		
			uciay(000),		
			while(*ptr!='\0')		
			ptr; lcd_data();		
			ptr ++;		
			}		
7	Block,	Circuit,			

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	Model Reaction Expecte	Diagram, n Equation, ed Graph		
8	Observa Look-up Output	ation Table, D Table,		
9	Sample Calculat	ions		
10	Graphs,	Outputs		
11	11 Results &Analysis			
12	Applicat	tion Areas	interface with external I/O devices is used to design interf computers with external devices	facing solutions of
13	Remark	S		
14	Faculty with Dat	Signature e		

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# page

Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

the uses