

HNC/HND ASSIGNMENT SPECIFICATION

Student name:		Student P number:	
Programme:	HNC / HND In Electrical and Electronic Engineering		
Module:	Microcontrollers and computing Micros Peripherals and Interfaces	Module Level (4, 5, 6):	4
Module code:		Contribution to Overall Module Assessment (%):	50 %
Lecturer:	Linton Cook	Internal Verifier:	Rabya Kadhim
Assignment Title:	Microcontrollers	Assignment No (x of x):	1 of 1
Hand Out Date:		Submission deadline:	

Referencing:	In the main body of your submission you must give credit to authors on whose research your work is based. Append to your submission a reference list that indicates the books, articles, etc. that you have read or quoted in order to complete this assignment (e.g. for books: surname of author and initials, year of publication, <u>title of book</u> , edition, publisher: place of publication).		
Disclosure:	I declare that this assignment is all my own work and that I have acknowledged all materials used from the published or unpublished works of other people. All references have been duly cited.		
Student's Signature:	<i>Assignments will not be accepted without a signature here</i>	Date:	
Turnitin: Lecturer to tick to indicate if an electronic version of the assignment must be submitted to Turnitin. Note: the Turnitin version is the primary submission and acts as a receipt for the student. Both electronic and paper versions MUST be submitted by the same deadline. No marks will be released until both submissions are received. Late submission of either the electronic or paper version will result in a late penalty mark. Penalties for late submission: Up to one week late, maximum mark of 40%. Over one week late, Refer. Only Year Tutors and the Programme Director may grant an extension.			YES
			NO ✓

Learning Outcomes tested (from module syllabus)	Assessment Criteria To achieve each outcome a student must demonstrate the ability to:
Demonstrate an understanding of low level programming language skills	Produce suitably documented programs to fulfil given design requirements

- Please submit the assignment parts in a suitable report folder or stapled– **NOT IN POLYPOCKETS**
- This form (ALL PAGES) **MUST** be at the front of the paper submission. Assignments will not be accepted without this form as it is a requirement that you sign the disclosure regarding referencing convention.
- **DO NOT** put this form into Turnitin or it will match many similarities with other students' submissions.

TASK DESCRIPTION

Task 1. Traffic lights

Part a)

It is required to provide traffic flow control at the intersection of two roads (see figure 1). This is to be achieved using traffic lights. The lights are to operate according to the sequence indicated in chart 1 below. Note that after number 8 the sequence returns to sequence number 1 and the whole sequence is repeated.

The lights are to be controlled using a PIC connected as indicated in the circuit diagram. You are required to produce a detailed code listing along with any other suitable documentation necessary to implement the desired control.

(30 marks)

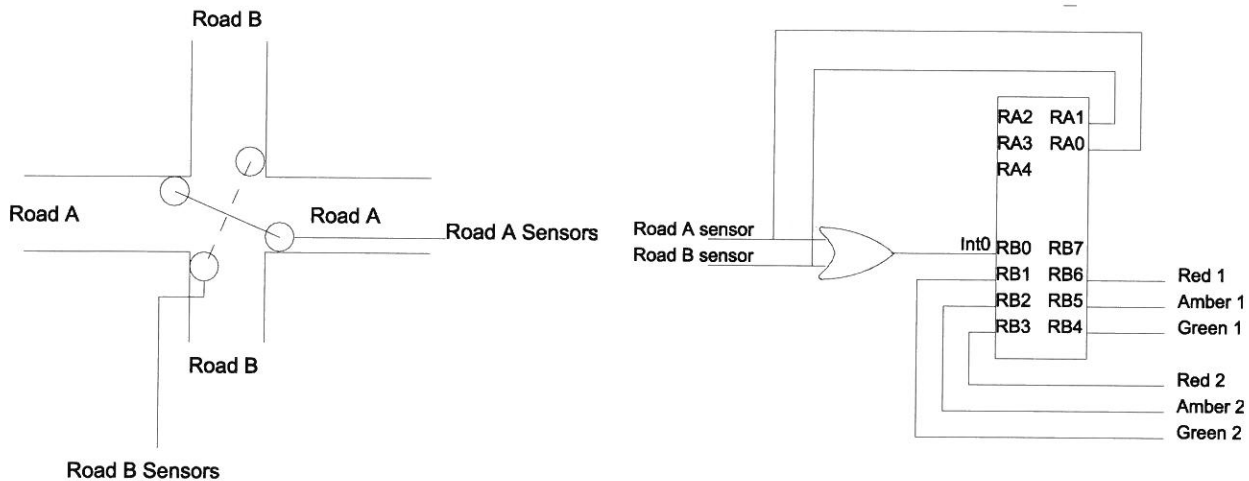


Figure 1

Circuit 1

		Road A			Road B		
Sequence No	Time seconds	Red 1	Amber 1	Green 1	Red 2	Amber 2	Green 2
1	40	1	0	0	0	0	1
2	5	1	0	0	0	1	0
3	5	1	1	0	1	0	0
4	1	0	1	0	1	0	0
5	40	0	0	1	1	0	0
6	5	0	1	0	1	0	0
7	5	1	0	0	1	1	0
8	1	1	0	0	0	1	0

Chart 1

Part b)

As an enhancement to the program described in part a) above (refer to circuit 1), additional control is to be included such that If a sensor is activated at road 'A' or road 'B' then an interrupt occurs at the processor. The processor reads the sensor inputs to determine which road sensor caused the interrupt.

If the sensor at road 'A' is activated then the sequence jumps to sequence number 3 (unless the current sequence position is number 4 or 5 in which case it simply continues).

If the sensor at road 'B' is activated then the sequence jumps to sequence number 7 (unless the current sequence position is 8 or 1 in which case it simply continues).

(15 marks)

Part c)

Identify any deficiencies that may exist within this algorithm and suggest possible solutions. You do not need to provide detailed code for the solutions to these deficiencies.

(5 marks)

Task 2. Motor Control

Part a)

Option 1)

You will be presented with a d.c. motor control module. The speed of the motor may be controlled using a Pulse Width Modulated signal as described in the LJ lab manual provided.

In summary the PWM control requires a positive 5V pulse that has a duration between 0.5mS and 1.5mS, with a repetition rate of 20mS as displayed in figure 2 below.

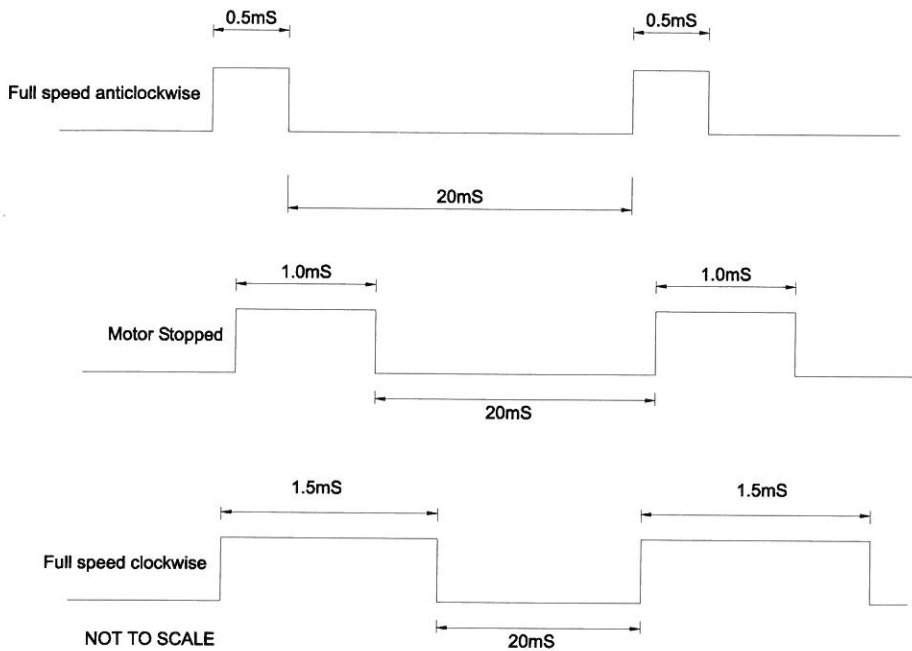


Figure 2

A pulse width of

- 0.5mS results in the motor rotating at full speed in an anticlockwise direction
- a pulse width of 1mS results in the motor being stopped
- a pulse width of 1.5mS results in the motor rotating at full speed in the clockwise direction.

There is a linear relationship between these pulse widths and the actual speed of the motor.

You are required to produce a program that controls the motor using an operator interface as shown in figure 3 below.

Switch A increases the speed by increasing / or decreasing the pulse width in increments of 0.01ms depending on the current rotation direction to be set by switch B. This implies that there are 50 speed settings available in both the clockwise and anti-clockwise directions. (switch A is a momentary acting push to make switch)

(20 marks)

Or

Option 2)

You may produce a PWM drive system for a DC motor of your choice as long as it includes the key operating features given in option 1. Check with your tutor before choosing this route in order to ensure its suitability.

(20 marks)

Part b)

The current speed setting will be displayed on the two BCD displays attached to the processor.

Switch B sets the direction of rotation and is a latching switch (Open = clockwise, Closed = anti clockwise)

Switch C is an overriding enable control and is latching. (Open = stop, Closed = run)

(20 marks)

(5 marks)

(5 marks)

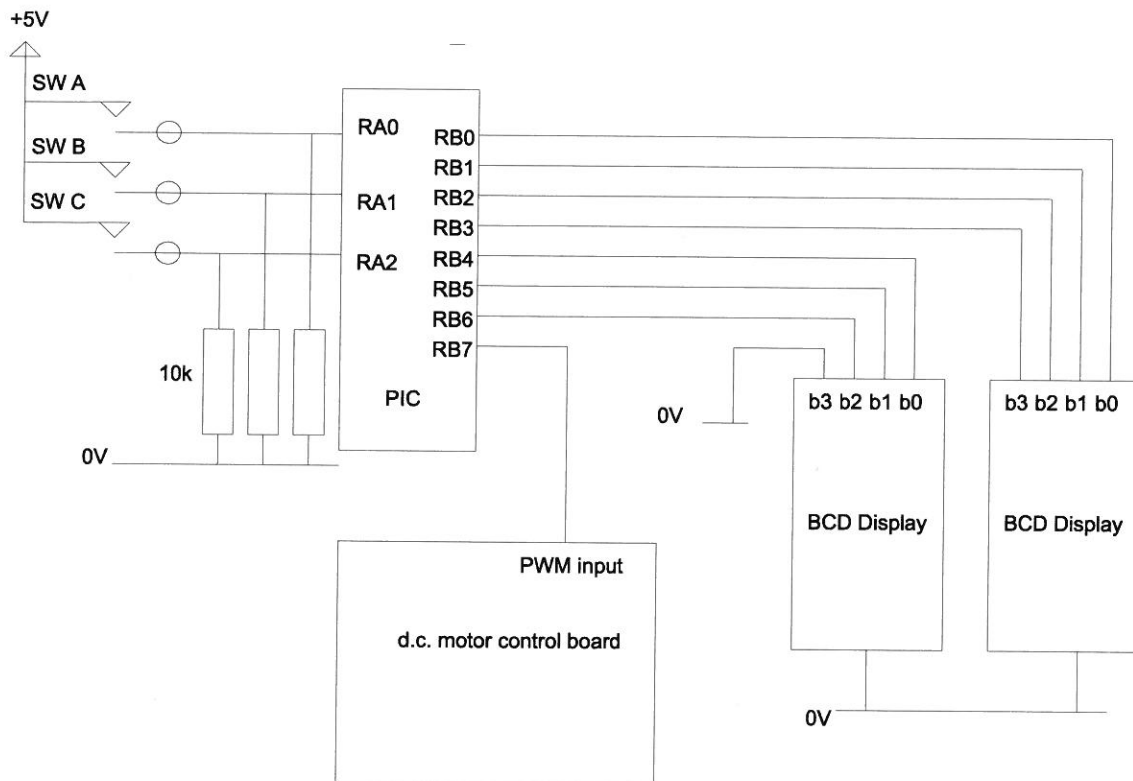


Figure 3

GUIDANCE FOR STUDENTS IN THE COMPLETION OF TASKS

MPLABX IDE is available on all PCs in B05. You are encouraged to obtain your own copy from the Microchip web site (it is freely available).

For testing on hardware we have Pickit3 available along with a number of PIC16f84A devices.

Task 1a Before producing any code for this problem you should produce design documentation. This could be in the form of flow charts, pseudo code, etc

If you will be attempting part b) you should take special care in the way that you structure your program. (part b has a 'state machine' structure) Marks will be given for efficient coding.

Task 1b Here you will be required to 'know where you are' within the main loop when the interrupt occurs and control where the program will progress to when *it returns to the main loop*, A simple linear structure to the main loop will not work.

Task 1c The task as described has some deficiencies – these should be identified. Any deficiencies that you identify within your program should also be identified.

Task 2

For this task you will produce a PWM signal that will control the speed and direction of a DC motor. The speed control will be via a momentary push button. There are issues with reading switches that you need to take onto account.

Again it is important that you first design your solution before attempting to produce code.

The display drivers require a conversion to BCD. You will need to develop a suitable algorithm.

MARKING CRITERIA AND STUDENT FEEDBACK

This section details the assessment criteria. The *extent* to which these are demonstrated by you determines your mark. The marks available for each criterion are shown. Lecturers will use the space provided to comment on the achievement of the task(s), including those areas in which you have performed well and areas that would benefit from development/improvement.

Common Assessment Criteria Applied	Marks available	Marks awarded
1. Research-informed Literature Extent of research and/or own reading, selection of credible sources, application of appropriate referencing conventions.		
	10	
2. Knowledge and Understanding of Subject Extent of knowledge and understanding of concepts and underlying principles associated with the discipline.		
	30	
3. Analysis Analysis, evaluation and synthesis; logic, argument and judgement; analytical reflection; organisation of ideas and evidence		
	10	
4. Practical Application and Deployment Deployment of methods, materials, tools and techniques; application of concepts; formulation of innovative and creative solutions to solve problems.		
	45	
5. Skills for Professional Practice Attributes in professional practice: individual and collaborative working; deployment of appropriate media; presentation and organisation.		
	5	

Assignment Mark Overall (Assessment marks are subject to ratification at the Exam Board. These comments and marks are to give feedback on module work and are for guidance only until they are confirmed.)

Late Submission Penalties (tick if appropriate)

Up to one-week late

Over one week late

%

COMMON ASSESSMENT AND MARKING CRITERIA

Assessment Criteria	OUTRIGHT FAIL	UNSATISFACTORY	SATISFACTORY	GOOD	VERY GOOD	EXCELLENT	EXCEPTIONAL
	0-29%	30-39%*	40-49%	50-59%	60-69%	70-79%	80-100%
1. Research-informed Literature Extent of research and/or own reading, selection of credible sources, application of appropriate referencing conventions	Little or no evidence of reading. Views and findings unsupported and non-authoritative. Referencing conventions largely ignored.	Poor evidence of reading and/or of reliance on inappropriate sources, and/or indiscriminate use of sources. Referencing conventions used inconsistently.	References to a limited range of mostly relevant sources. Some omissions and minor errors. Referencing conventions evident though not always applied consistently.	Inclusion of a range of research-informed literature, including sources retrieved independently. Referencing conventions mostly consistently applied.	Inclusion of a wide range of research-informed literature, including sources retrieved independently. Selection of relevant and credible sources. Very good use of referencing conventions, consistently applied.	A comprehensive range of research informed literature embedded in the work. Excellent selection of relevant and credible sources. High-level referencing skills, consistently applied.	Outstanding knowledge of research-informed literature embedded in the work. Outstanding selection of relevant and credible sources. High-level referencing skills consistently and professionally applied.
2. Knowledge and Understanding of Subject Extent of knowledge and understanding of concepts and underlying principles associated with the discipline.	Major gaps in knowledge and understanding of material at this level. Substantial inaccuracies.	Gaps in knowledge, with only superficial understanding. Some significant inaccuracies.	Evidence of basic knowledge and understanding of the relevant concepts and underlying principles.	Knowledge is accurate with a good understanding of the field of study.	Knowledge is extensive. Exhibits understanding of the breadth and depth of established views.	Excellent knowledge and understanding of the main concepts and key theories. Clear awareness of challenges to established views and the limitations of the knowledge base.	Highly detailed knowledge and understanding of the main theories/concepts, and a critical awareness of the ambiguities and limitations of knowledge.
3. Analysis Analysis, evaluation and synthesis; logic, argument and judgement; analytical reflection; organisation of ideas and evidence	Unsubstantiated generalisations, made without use of any credible evidence. Lack of logic, leading to unsupportable/missing conclusions. Lack of any attempt to analyse, synthesise or evaluate.	Some evidence of analytical intellectual skills, but for the most part descriptive. Ideas/findings sometimes illogical and contradictory. Generalised statements made with scant evidence. Conclusions lack relevance.	Evidence of some logical, analytical thinking and some attempts to synthesise, albeit with some weaknesses. Some evidence to support findings/ views, but evidence not consistently interpreted. Some relevant conclusions and recommendations, where relevant	Evidence of some logical, analytical thinking and synthesis. Can analyse new and/or abstract data and situations without guidance. An emerging awareness of different stances and ability to use evidence to support the argument. Valid conclusions and recommendations, where relevant	Sound, logical, analytical thinking; synthesis and evaluation. Ability to devise and sustain persuasive arguments, and to review the reliability, validity & significance of evidence. Ability to communicate ideas and evidence accurately and convincingly. Sound, convincing conclusions / recommendations.	Thoroughly logical work, supported by evaluated evidence. High quality analysis, developed independently or through effective collaboration. Ability to investigate contradictory information and identify reasons for contradictions. Strong, persuasive, conclusions, justifiable recommendations.	Exceptional work; judiciously selected and evaluated evidence. Very high quality analysis, developed independently or through effective collaboration. Ability to investigate contradictory information and identify reasons for contradictions. Highly persuasive conclusions
4. Practical Application and Deployment Effective deployment of appropriate methods, materials, tools and techniques; extent of skill demonstrated in the application of concepts to a variety of processes and/or contexts; formulation of innovative and creative solutions to solve problems.	Limited or no use of methods, materials, tools and/or techniques. Little or no appreciation of the context of the application.	Rudimentary application of methods, materials, tools and/or techniques but without consideration and competence. Flawed appreciation of the context of the application.	An adequate awareness and mostly appropriate application of well established methods, materials, tools and/or techniques. Basic appreciation of the context of the application.	A good and appropriate application of standard methods, materials, tools and/or techniques. Good appreciation of the context of the application, with some use of examples, where relevant.	A very good application of a range of methods, materials, tools and/or techniques. Very good consideration of the context of the application, with perceptive use of examples, where relevant. Evidence of some innovation and creativity.	An advanced application of a range of methods, materials, tools and/or techniques. The context of the application is well considered, with extensive use of relevant examples. Application and deployment extend beyond established conventions. Innovation and creativity evident throughout.	Outstanding levels of application and deployment skills. Assimilation and development of cutting edge processes and techniques.
5. Skills for Professional Practice Demonstrates attributes expected in professional practice including: individual initiative and collaborative working; deployment of appropriate media to communicate	Communication media is inappropriate or misapplied. Little or no evidence of autonomy in the completion of tasks. Work is poorly structured and/or largely incoherent.	Media is poorly designed and/or not suitable for the audience. Poor independent or collaborative initiative. Work lacks structure, organisation, and/or coherence	Can communicate in a suitable format but with some room for improvement. Can work as part of a team, but with limited involvement in group activities. Work lacks coherence in places and could be better structured.	Can communicate effectively in a suitable format, but may have minor errors. Can work effectively as part of a team, with clear contribution to group activities. Mostly coherent work and is in a suitable structure.	Can communicate well, confidently and consistently in a suitable format. Can work very well as part of a team, with very good contribution to group activities. Work is coherent and fluent and is well structured and organised.	Can communicate professionally and, confidently in a suitable format. Can work professionally within a team, showing leadership skills as appropriate, managing conflict and meeting obligations. Work is coherent, very fluent and is presented	Can communicate with an exceptionally high level of professionalism. Can work exceptionally well and professionally within a team, showing advanced leadership skills. Work is exceptionally coherent, very fluent and is

(including written and oral); clarity and effectiveness in presentation and organisation.						professionally.	presented professionally.
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Student Self Evaluation Form

Student name:		Student P number:	
Programme:		Year of programme	
Assignment Title:			

This section repeats in brief the common assessment criteria detailed on previous pages. The *extent* to which these are demonstrated by you determines your mark. Using these criteria, tick the box that best indicates the level of achievement you feel you have achieved with regard to each of them.

Common Assessment Criteria Applied	Level of Achievement						
	REFER		3 rd	2:2	2:1	1 st	1 st
	OUTRIGHT FAIL	UNSATISFACTORY	SATISFACTORY	GOOD	VERY GOOD	EXCELLENT	EXCEPTIONAL
1. Research-informed Literature	0-29% ☐	30-39% ☐	40-49% ☐	50-59% ☐	60-69% ☐	70-79% ☐	80-100% ☐
2. Knowledge and Understanding of Subject	0-29% ☐	30-39% ☐	40-49% ☐	50-59% ☐	60-69% ☐	70-79% ☐	80-100% ☐
3. Analysis	0-29% ☐	30-39% ☐	40-49% ☐	50-59% ☐	60-69% ☐	70-79% ☐	80-100% ☐
4. Practical Application and Deployment	0-29% ☐	30-39% ☐	40-49% ☐	50-59% ☐	60-69% ☐	70-79% ☐	80-100% ☐
5. Skills for Professional Practice	0-29% ☐	30-39% ☐	40-49% ☐	50-59% ☐	60-69% ☐	70-79% ☐	80-100% ☐

PLEASE COMMENT ON AREAS IN WHICH YOU FEEL THAT YOU HAVE PERFORMED WELL	PLEASE COMMENT ON AREAS YOU FEEL THAT YOU NEED TO DEVELOP

Student's Name		Date	
Student's Signature			