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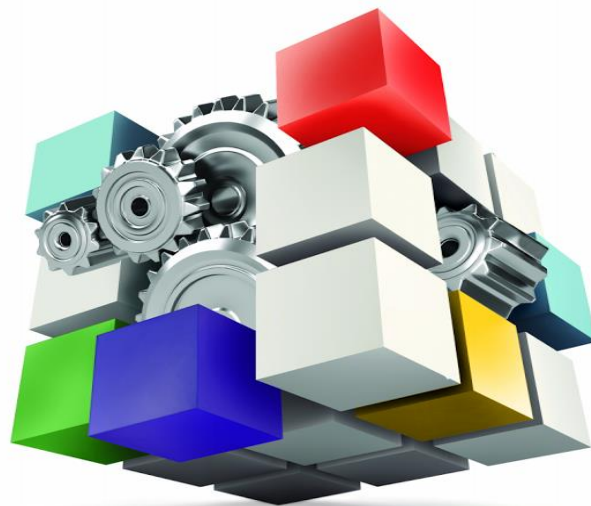


Mark Scheme (Results)

Summer 2018

BTEC Level 3 National in Engineering

Unit 6: Microcontroller Systems for  
Engineers (31725H)



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## **Unit 6: Microcontroller Systems for Engineers**

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### **General marking guidance**

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Marking grids should be applied positively. Learners must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the marking grid not according to their perception of where the grade boundaries may lie.
- All marks on the marking grid should be used appropriately.
- All the marks on the marking grid are designed to be awarded. Examiners should always award full marks if deserved. Examiners should also be prepared to award zero marks if the learner's response is not rewardable according to the marking grid.
- Where judgement is required, a marking grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the marking grid to a learner's response, a senior examiner should be consulted.

### **Specific marking guidance**

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The marking grids have been designed to assess learner work holistically. Rows within the grids identify the assessment focus/outcome being targeted. When using a marking grid, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches the learner response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer in response to the assessment focus/outcome and will be modified according to how securely all bullet points are displayed at that band.
- Marks will be awarded towards the top or bottom of that band depending on how they have evidenced each of the descriptor bullet points.

**Activity 2: Analysis of the brief**

**Evidence:** Electronic task booklet – technical specification

Assessment focus	Band 0	Band 1	Band 2	Band 3	Band 4
Technical specification	<p><b>0</b></p> <p>Level of response not worthy of credit</p>	<p><b>1-3</b></p> <ul style="list-style-type: none"> <li>• Interpret the brief into limited operational requirements that partially meet the brief.</li> </ul>	<p><b>4-6</b></p> <ul style="list-style-type: none"> <li>• Interpret the brief into a set of operational requirements that meet some elements of the brief.</li> </ul>	<p><b>7-9</b></p> <ul style="list-style-type: none"> <li>• Interpret the brief into a comprehensive set of operational requirements that mostly meet the brief and considers enhanced user experience.</li> </ul>	<p><b>n/a</b></p>
		<ul style="list-style-type: none"> <li>• An outline test plan has been produced with parameters that demonstrate a limited understanding of the system.</li> </ul>	<ul style="list-style-type: none"> <li>• A test plan has been produced with parameters that demonstrate a partial understanding of the system under normal conditions.</li> </ul>	<ul style="list-style-type: none"> <li>• A detailed test plan has been produced with parameters that demonstrate an understanding of the system under normal conditions and considers unexpected events.</li> </ul>	

### Activity 3: System design

**Evidence:** Electronic task booklet - input/output devices, hardware selected, system connection diagrams/schematics and program structure.

Assessment focus	Band 0	Band 1	Band 2	Band 3	Band 4
System design	<b>0</b> Level of response not worthy of credit	<b>1-4</b> <ul style="list-style-type: none"> <li>Hardware input and output device selection is occasionally appropriate for the operational requirements.</li> </ul>	<b>5-8</b> <ul style="list-style-type: none"> <li>Hardware input and output device selection is appropriate for some of the operational requirements.</li> </ul>	<b>9-12</b> <ul style="list-style-type: none"> <li>Hardware input and output device selection is appropriate for most of the operational requirements and some are justified.</li> </ul>	<b>13-16</b> <ul style="list-style-type: none"> <li>Hardware input and output device selection is appropriate and justified for the operational requirements.</li> </ul>
		<ul style="list-style-type: none"> <li>Limited description of the function of the input and output devices excluding the microcontroller connections.</li> </ul>	<ul style="list-style-type: none"> <li>Brief description of the function of the input and output devices including the microcontroller connections.</li> </ul>	<ul style="list-style-type: none"> <li>A partially detailed and partly accurate description of the function of the input and output devices including the microcontroller connections.</li> </ul>	<ul style="list-style-type: none"> <li>Mostly detailed and mostly accurate description of the function of the input and output devices including the microcontroller connections.</li> </ul>
		<ul style="list-style-type: none"> <li>Limited use of technical terminology and industry standard conventions.</li> </ul>	<ul style="list-style-type: none"> <li>The use of technical terminology and industry standard conventions is used appropriately in some cases.</li> </ul>	<ul style="list-style-type: none"> <li>Technical terminology and industry standard conventions is used appropriately in most cases.</li> </ul>	<ul style="list-style-type: none"> <li>Technical terminology and industry standard conventions are used appropriately and consistently.</li> </ul>
		<ul style="list-style-type: none"> <li>Evidence of program design is limited.</li> </ul>	<ul style="list-style-type: none"> <li>An outline design for the program structure considers some key operations.</li> </ul>	<ul style="list-style-type: none"> <li>A design for the program structure breaks down key operations into relevant constructs that mostly link together.</li> </ul>	<ul style="list-style-type: none"> <li>A detailed design for the program structure breaks down key operations into relevant constructs that link logically including the handling of some unexpected events.</li> </ul>

#### Activity 4: System assembly and programming

**Evidence:** Electronic task booklet - annotated code

Assessment focus	Band 0	Band 1	Band 2	Band 3	Band 4
Program quality	<b>0</b>	<b>1-4</b>	<b>5-8</b>	<b>9-12</b>	<b>13-16</b>
	Level of response not worthy of credit	<ul style="list-style-type: none"> <li>The program comprises of limited and simple constructs, a few of which have been appropriately selected or correctly used.</li> </ul>	<ul style="list-style-type: none"> <li>The program comprises of simple but appropriate constructs, some of which have been used correctly.</li> </ul>	<ul style="list-style-type: none"> <li>The program comprises of a range of appropriate constructs that have mostly been used correctly. The program is efficient some of the time.</li> </ul>	<ul style="list-style-type: none"> <li>The program comprises of a range of appropriate constructs that have been used correctly. The program is mostly efficient and has the facility to handle some unexpected events.</li> </ul>
		<ul style="list-style-type: none"> <li>Annotation is occasionally present and demonstrates limited understanding of the key areas of the program.</li> </ul>	<ul style="list-style-type: none"> <li>Annotation is sometimes present but focused in one area of the program and demonstrates some understanding of the key areas of the program.</li> </ul>	<ul style="list-style-type: none"> <li>Annotation is mostly present and demonstrates good understanding of the key areas of the program and the constructs used.</li> </ul>	<ul style="list-style-type: none"> <li>Annotation is consistent and suitable and demonstrates thorough understanding of the key areas of the program and the constructs used.</li> </ul>
	<ul style="list-style-type: none"> <li>The program structure lacks organisation and formatting.</li> </ul>	<ul style="list-style-type: none"> <li>The program structure is partially organised and formatted.</li> </ul>	<ul style="list-style-type: none"> <li>The program structure is mostly well organised and formatted so that a competent third party could interpret and update the program.</li> </ul>	<ul style="list-style-type: none"> <li>The program structure is well organised and formatted so that a competent third party could efficiently interpret and update the program.</li> </ul>	

**Activity 5: System testing and results analysis**

**Evidence:** Electronic task booklet (test data, and analysis of data) and the audio visual recording (to make a judgement on the outcome from many tests and the system in operation)

Assessment focus	Band 0	Band 1	Band 2	Band 3	Band 4
Test results and analysis	<b>0</b>	<b>1-3</b>	<b>4-6</b>	<b>7-9</b>	<b>n/a</b>
	Level of response not worthy of credit	<ul style="list-style-type: none"> <li>• Test results demonstrate that limited testing has been carried out.</li> </ul>	<ul style="list-style-type: none"> <li>• Test results demonstrate that some suitable testing has been carried out.</li> </ul>	<ul style="list-style-type: none"> <li>• Test results demonstrate that structured testing has been carried out that includes some unexpected events.</li> </ul>	
		<ul style="list-style-type: none"> <li>• The evaluation of the system against the client brief is limited and/or is not supported by test results.</li> </ul>	<ul style="list-style-type: none"> <li>• The evaluation of the system against the client brief is partially supported by test results.</li> </ul>	<ul style="list-style-type: none"> <li>• The evaluation of the system against the client brief is mostly supported by the test results.</li> </ul>	

### Activity 6: System in operation

**Evidence:** audio-visual recording (to make a judgement on the outcome of most tests and the system in operation)

Assessment focus	Band 0	Band 1	Band 2	Band 3	Band 4
System in operation	<b>0</b>	<b>1-5</b>	<b>6-10</b>	<b>11-15</b>	<b>16-20</b>
	Level of response not worthy of credit	<ul style="list-style-type: none"> <li>The audio-visual recording shows a system that has limited functionality.</li> </ul>	<ul style="list-style-type: none"> <li>The audio-visual recording shows a partially functioning system that meets some of the requirements of the brief.</li> </ul>	<ul style="list-style-type: none"> <li>The audio-visual recording shows a mostly functioning system that mostly meets the requirements of the brief. The system shows some consideration of the user experience.</li> </ul>	<ul style="list-style-type: none"> <li>The audio-visual recording shows a functioning system that meets the requirements of the brief. The system shows consideration of the user experience and the handling of unexpected events.</li> </ul>
		<ul style="list-style-type: none"> <li>Audio-visual commentary shows a limited understanding of how the system operates and the relationship between the hardware and the program.</li> </ul>	<ul style="list-style-type: none"> <li>Audio-visual commentary shows some understanding of how the system operates and the relationship between the hardware and the program.</li> </ul>	<ul style="list-style-type: none"> <li>Audio-visual commentary shows a good understanding of how the system operates and the relationship between the hardware and the program.</li> </ul>	<ul style="list-style-type: none"> <li>Audio-visual commentary shows thorough understanding of how the system operates and the relationship between the hardware and the program.</li> </ul>
	<ul style="list-style-type: none"> <li>Limited use of technical terminology.</li> </ul>	<ul style="list-style-type: none"> <li>Some accurate technical terminology is used.</li> </ul>	<ul style="list-style-type: none"> <li>Technical terminology is used accurately most of the time.</li> </ul>	<ul style="list-style-type: none"> <li>Technical terminology is used appropriately and consistently.</li> </ul>	



**Activity 1: Planning and design changes made during the development process**

**Evidence:** Electronic task booklet – development approach (to be completed throughout all activities)

<b>Assessment focus</b>	<b>Band 0</b>	<b>Band 1</b>	<b>Band 2</b>	<b>Band 3</b>	<b>Band 4</b>
Carry out an iterative development process	<b>0</b>	<b>1-4</b>	<b>5-7</b>	<b>8-10</b>	<b>n/a</b>
	Level of response not worthy of credit	<ul style="list-style-type: none"> <li>• Entries demonstrate a limited and unstructured approach to the development process.</li> </ul>	<ul style="list-style-type: none"> <li>• Entries demonstrate some evidence of an iterative approach to the development process.</li> </ul>	<ul style="list-style-type: none"> <li>• Entries demonstrate a logical and iterative approach to the development process.</li> </ul>	
		<ul style="list-style-type: none"> <li>• Development activities may not have been carried out in an appropriate order.</li> </ul>	<ul style="list-style-type: none"> <li>• Development activities have sometimes been carried out in an appropriate order.</li> </ul>	<ul style="list-style-type: none"> <li>• Development activities have mostly been carried out in an appropriate order.</li> </ul>	
		<ul style="list-style-type: none"> <li>• Limited use of technical terminology.</li> </ul>	<ul style="list-style-type: none"> <li>• Some accurate technical terminology is used.</li> </ul>	<ul style="list-style-type: none"> <li>• Technical terminology is used accurately most of the time.</li> </ul>	
<p>Entries are largely narrative and include:</p> <ul style="list-style-type: none"> <li>• An attempt to justify a few of the changes made to the original system design, hardware and program during the process. The justification will be limited and may not be linked clearly to evidence of testing.</li> </ul>		<p>Entries are descriptive and partially supported and include:</p> <ul style="list-style-type: none"> <li>• A supported justification of some of the changes that have been made to original designs. The justification shows some incomplete chains of reasoning between formative testing and the changes made.</li> </ul>	<p>Entries are concise, detailed and supported and include:</p> <ul style="list-style-type: none"> <li>• A supported justification of most of the changes that have been made to original designs. The justification demonstrates logical chains of reasoning between formative testing and the changes made.</li> </ul>		

		<ul style="list-style-type: none"><li>• Action points for the next external assessment period are vague or incomplete.</li></ul>	<ul style="list-style-type: none"><li>• Action points for the next external assessment period are identified but not well defined or prioritised.</li></ul>	<ul style="list-style-type: none"><li>• Well-defined, logical and prioritised action points for the next external assessment period are identified.</li></ul>	
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