Pearson BTEC Sample Set Assignment Brief

Single-Part Assessment

Unit 6 – Microcontroller Systems for Engineers

For use with:

Pearson BTEC International Level 3 qualifications in Engineering

Extended Diploma

Advised supervised hours	12 hours

For completion by the centre

Qualification	Extended Diploma
Assessment date	

Pearson BTEC

Instructions to tutors and/or invigilators

The Pearson Set Assignment will be assessed internally by the centre, using the unit assessment criteria given in the qualification specification. The Set Assignment will be sampled by the Standards Verifier as part of the annual standards verification centre visit.

Conditions of supervision

The Pearson Set Assignment should be undertaken in conditions that assure the authenticity of outcome. This may require supervision.

We advise that the Pearson Set Assignment be completed in sessions that come to a total of 12 hours. The Pearson Set Assignment should not be shared with learners prior to the start of the assessment period. Teachers/tutors are responsible for security of the Pearson Set Assignment and materials.

Work should be completed on a computer using appropriate hardware and software as listed in the unit content. Learners should complete the electronic task booklet provided by Pearson. This can be downloaded from the Pearson website. Learners must not have access to the internet. One electronic task booklet and one audio-visual recording must be submitted for each learner.

Learners will need access to suitable audio-visual recording equipment and the footage should be recorded in an appropriate file format. The recording must be readable through one of the following software applications: Windows Movie Maker, Real Time, VLC or QuickTime. Recordings must be saved in one of the following file types: MPEG, FLV, MOV, WMV or RM.

We advise that centres ensure that all electronic documents are backed up securely and kept until the end of the post-results service window.

All learner work must be completed independently and authenticated by the tutor and/or invigilator before being assessed.
Centres are free to arrange the assessment period however they wish, provided the 12 hours for producing final outcomes are under the level of control specified. Once the learner has started the task, we recommend the assessment be completed in five consecutive working days.
If learners are to produce a solution to the task using individual electronic components and/or a prototyping board, they may need the Source Booklet. Centres can also provide learners with original equipment manufacturers' data sheets for individual electronic devices, for example liquid crystal display (LCD) screens and microcontrollers, so that learners can assemble their prototype solution in an appropriate way. The data sheets should not contain any other extraneous handwritten information.
For lower-level programming languages, such as 'C', learners can also be given a list of common commands/instructions. The list must cover the syntax of the commands/instructions only. For example, the list may include: 'if (x<5){ } else { }'. They can also use software library code as part of their solution to the task, as it is common industry practice when using low-level programming languages.
An authentication statement will be required confirming that learner work has been completed as directed.
Learners must not bring anything into the assessment environment or take anything out without tutor knowledge and approval. Centres are responsible for putting appropriate checks in place to ensure that only permitted material is introduced to the assessment environment.

Maintaining security

During the task, we recommend:
- Learners not have access to the internet.
- During any break, materials are kept securely.
- User areas are be accessible to the individual learner and to named members of staff only.
- Learners' work is backed up regularly.
- Any work that learners produce be kept secure.
- Any materials being used by learners must be labelled and collected in at the end of each period, stored securely and handed back at the beginning of the next period.

Outcomes for submission

Each learner will need to submit the following.

(a) An electronic task booklet (in PDF format), that contains the following evidence:
- task planning and system design changes made during the development process
- a technical specification with operational requirements
- a test plan
- details and justifications of input/output devices and hardware selected
- system connection diagrams/schematics
- design of the program structure
- annotated copy of all the code
- test data and analysis.

(b) An audio-visual file (recording) of a maximum length of three minutes.
Each learner will need to submit evidence using, for example, the file names below:
- Electronic task booklet: booklet [surname]_[first letter of first name]
- Audio-visual file: file [surname]_[first letter of first name]

A fully completed authentication sheet must be completed by each learner.

Instructions to learners

Read the set task information carefully.

You will be asked to carry out specific activities using the information provided. You will be given a specific time period to complete the assignment.

You must plan your time accordingly and be prepared to submit all the required evidence by the date specified. You may use a calculator and will have access to a computer but not the internet.

You must work independently throughout the assessment period and you must not share your work with other learners.

Your teacher/tutor may clarify the wording that appears in this task but cannot provide any guidance on how to complete the task. You may need to use the information booklet.

Outcomes for submission

You will need to submit the following.

(a) An electronic task booklet (in PDF format) that contains the following evidence:
- task planning and system design changes made during the development process
- a technical specification with operational requirements
- a test plan
- details and justifications of input/output devices and hardware selected
- system connection diagrams/schematics
- design of the program structure
- annotated copy of all the code
- test data and analysis.

(b) an audio-visual file (recording) of a maximum length of three minutes.

You will need to submit evidence using, for example, the file names below:
- Electronic task booklet: booklet [surname]_[first letter of first name]
- Audio-visual file: file [surname]_[first letter of first name]

You must work independently at all times and must not share your work with other learners.

You must complete an authentication sheet and submit it along with your work.

Set Assignment information

Set Task Brief

Scenario
You are employed as an engineer by a consumer electronic product manufacturer that specialises in the design of embedded microprocessor-based products.

You have been presented with the client brief to develop a professional egg timer.

Client brief
190Hotels has 275 hotels worldwide, with almost 185,000 rooms. A high-quality cooked breakfast is an important part of the guest experience. Boiled eggs are a popular choice at breakfast but guest requirements vary greatly in terms of the degree of cooking required. The head chef has contracted your company to design a professional egg timer to be installed in the hotel kitchens to help with the difficulties that staff have with timing the perfect boiled egg for their demanding customers. Each egg-boiler station cooks one egg at a time and the head chef wants to have one egg timer per station.

Customers often specify the number of minutes they would like their egg to be cooked for, for example from a soft-boiled 'two-minute egg' to a hard-boiled 'six-minute egg'. Guests may request any number of minutes between these two times.

The hotel kitchen environment is noisy and frenetic, and multiple chefs are often multitasking when preparing table orders, with several items needing to be ready for service at the same time. It must be apparent, therefore, that the timer is running and the amount of time remaining must be obvious so that they can get their timings right. Once it has finished timing, to avoid overcooking the device must be able to gain attention and remain obvious until attended. Sometimes there are errors or changes to customer orders and boiled eggs may be cancelled.

To monitor the cooking process, 190Hotels has requested a prototype system that will, as a minimum:
- indicate when the timer is operating
- indicate the remaining cooking time for an egg from two to six minutes
- indicate when the cooking time is complete.

If a major fault occurs during the cooking process, the client would like the option to immediately pause the prototype system.
In developing the prototype system, you should consider enhanced **user experiences** and how it would deal with any **unexpected events** that may occur.

You need to:
- produce a record of task planning and system design changes made during the development process
- interpret the brief as to operational requirements
- design a test plan based on operational requirements
- select and describe appropriate input/output components and how they will work together
- design the program structure
- produce a functional system
- annotate a program or code to demonstrate understanding
- test the system and analyse the outcomes from testing
- produce an audio-visual recording of the system that is no longer than three minutes.

Set Task

Task

Design, assemble, program and test a safe prototype system to monitor the cooking time for each egg that meets the requirements of the client brief.

To monitor the cooking process, 190Hotels has requested a prototype system that will, as a minimum:

- indicate when the timer is operating
- indicate the remaining cooking time for an egg from two to six minutes
- indicate when the cooking time is complete.

If a major fault occurs during the cooking process, the client would like the option to immediately pause the prototype system.

The client has **not** specified all the prototype system's functions and constraints. These other functions and constraints are for you, as the developer, to determine and justify. For example, the client has not specified the type of indicators to be used.

You must follow an appropriate development process and use a microcontroller.

You will have a total of 12 hours to complete your prototype system (including testing, documentation and audio-visual recording), which may be split into several shorter periods.

Health and safety notice

Standard health and safety procedures **must** be followed at all times.

The operation and testing of the prototype system does not require the use of water (boiling or otherwise) and must not use any kitchen equipment.

Pearson BTEC Level 3 International Qualifications in Engineering

Engineering

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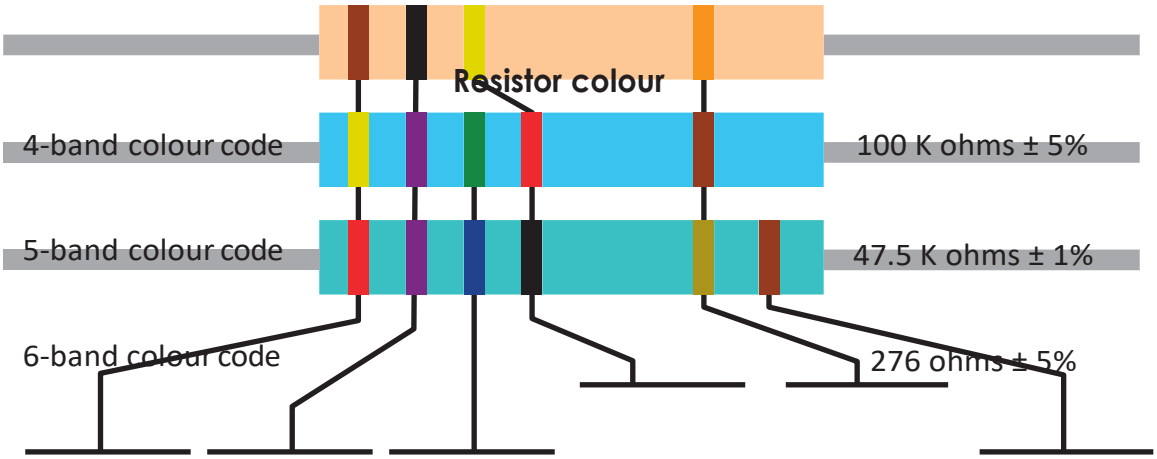
Source Booklet



First digit	Second digit	Third digit	Multiplier	Tolerance	Temperature coefficient
BLACK-0	BLACK-0	BLACK-0	SILVER 0.01	SILVER ± 10%	BROWN-100 ppm
BROWN-1	BROWN-1	BROWN-1	GOLD 0.1	GOLD ± 5%	RED-50 ppm
RED-2	RED-2	RED-2	BLACK-1	BROWN ± 1%	ORANGE-15 ppm
ORANGE-3	ORANGE-3	ORANGE-3	BROWN-10	RED ± 2%	YELLOW-25 ppm
YELLOW-4	YELLOW-4	YELLOW-4	RED-100	GREEN ±0.5%	
GREEN-5	GREEN-5	GREEN-5	ORANGE-1 K	BLUE ± 0.25%	
BLUE-6	BLUE-6	BLUE-6	YELLOW-10 K	VIOLET ± 0.1%	
VIOLET-7	VIOLET-7	VIOLET-7	GREEN-100 k		
GREY-8	GREY-8	GREY-8	BLUE-1 M		
WHITE-9	WHITE-9	WHITE-9	VIOLET-10 M		

Original Equipment Manufacturer's (OEM) Data Sheets

You can refer to data sheets for individual electronic devices, e.g. liquid crystal display (LCD) screens and microcontroller connections, so that you can assemble your prototype solution in an appropriate way.

Use of library code and access to a list of programming instructions/commands

Learners can use software library code as part of their solution to the task as it is common industry practice when using low-level programming languages.

For lower-level programming languages, such as 'C', learners can also be given a list of common commands/instructions. The list must cover the syntax of the commands/instructions only. For example, the list may include: 'if (x<5){ } else { }'.

Learners **must not** have access to the internet during the task.

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Engineering

Unit 6: Microcontroller Systems

Task Booklet

Complete your work in this electronic task booklet.

Activity 1

Task planning and system design changes

You are advised to spend no longer than 1.5 hours on this activity.

At the start of the task, create a short project time plan and use it to monitor your progress throughout the rest of the task and make any adjustments as required.

During the other activities (2 to 5), you should also **record in the Activity 1 section** of your electronic task booklet:

- What you did in the session
- Details of any issues encountered in this session and solutions discovered
- Action points for the next session.

Initial Task Plan

Instruction – during each session, complete the following logbook, duplicating the table as required for each session (cut and paste the table as required).

Remember to update the project time plan/Gantt chart at the start of each session
Date:
What I have done this session:
Issues encountered this session and solutions with justification:
Action points for the next session:

Activity 2

Analysis of the brief

You are advised to spend no longer than 1.5 hours on this activity.

- By interpreting the client brief into operational requirements, prepare a technical specification for a user friendly system that can handle some unexpected events.
- Prepare a test plan to check the functionality of the final solution against the technical specification and include some unexpected events.

Test Plan Template (Activity 2)

Tests can include unexpected events (i.e. non-routine) that are outside the normal operation of the system.

Test number	Purpose of test	Test condition	Expected result

Activity 3

System design

You are advised to spend no longer than 2.5 hours on this activity.

Prepare a user friendly system design that can handle some unexpected events, including:

- The selection and justification of suitable input and output devices
- A description of the system design covering input and output devices and microcontroller connections
- A plan for the program structure detailing key system operations.

For **Activity 3** you could provide: written notes, annotated diagrams, flow charts, images, schematics, pseudocode and tables.

Activity 4

System assembly and programming

You are advised to spend no longer than 2.5 hours on this activity.

Develop a user friendly system that is well organised, structured and formatted, including:

- Producing the software program and annotating the code
- The assembly of any hardware (if required)
- Refining the system so that it operates as expected and can handle some unexpected events.

For **Activity 4** you could provide: written notes, screenshots, annotated programs/flow charts and images.

Activity 5

System testing and results analysis

You are advised to spend no longer than 1.5 hours on this activity.

- Test the system using the test plan (from Activity 2) and include some unexpected events.
- Record the outcome of each test in the template provided.
- Analyse the test results and evaluate the system for conformance against the client brief.

Test Plan Template (Activity 5)

Tests can include unexpected events (i.e. non-routine) that are outside the normal operation of the system.

Copy and paste your Test Plan from **Activity 2** into the table below and complete the **Activity 5** columns.

Activity 2				Activity 5	
Test number	**Purpose of test**	**Test condition**	**Expected result**	**Actual result**	**Comments and justification**

Activity 6

System in operation

You are advised to spend no longer than 2.5 hours on this activity.

Produce an audio-visual recording that demonstrates the system in operation, which should include:

- Your name, learner registration number and centre number at the start
- A commentary explaining the operation of the user friendly system and how its behaviour is linked with your chosen hardware and the software program
- Recorded evidence of the outcome from suitable tests including some unexpected events (from Activity 5).

Please note that the evidence for this activity should be in one separate audio-visual recording of no more than three minutes.

Do not add any comments for Activity 6 into this electronic task booklet.