

## TMA 03

This tutor-marked assignment (**TM111 TMA 03**) must be submitted by 12 noon (UK local time) on **11 September 2025**.

This module requires all assignments to be submitted electronically. To submit an assignment, please follow the link(s) from your StudentHome page to the online TMA/EMA service.

**Note: no extensions are allowed for TMA 03.** If you submit your assignment late it will not be marked and you will not be able to pass the module. For more details please see the [emTMA Policy](#) and the [TM111 Assessment guide](#).

If you foresee any difficulty with submitting your assignment on time, you should contact your tutor or, in an emergency, your Student Support Team, well in advance of the cut-off date.

Important – help with assignment questions

You should read the [TM111 Assessment guide](#) in the Assessment section of the TM111 website before answering the questions here.

All written answers must be submitted in a word-processor document that is compatible with Microsoft Word. See the section on [‘What to submit for TMAs’](#) in the *TM111 Assessment guide*.

You must provide a word count for each question or question part where a limit is specified.

Questions 1 and 2 allow you to demonstrate your ability to perform calculations such as those introduced in both Block 3, Parts 1 and 2 and the [Using numbers \(maths\) booklet](#). In each case, you should demonstrate how you worked out your answer, as well as *giving the answer*. You **must** show your working to gain full marks; about 50% of the marks are awarded for a clear explanation of your working. The [Numerical answers](#) section of the *TM111 Assessment guide* includes an example of how to present calculations and working.

If you need further guidance on any assignment questions, please ask your tutor, who will be happy to help.

Reminder: in order to pass the module, you will need to gain a weighted average of 40% or more for your TMAs and iCMAs **and gain a mark of at least 30% for TMA 03**. The weighted average of your iCMA and TMA scores will give your overall module score.

### Question 1 (30 marks)

a. You will have received feedback from your tutor for TMA 01 and TMA 02. Choose **one** piece of feedback, from either TMA 01 or TMA 02, that you found particularly helpful. Either copy this feedback into your answer or explain what the feedback said.

- i. State which TMA, which question, and which question part the feedback relates to.
- (1 mark)
- ii. Explain how you found the feedback helpful.
- (3 marks)
- iii. Explain how you used this feedback to improve your work on subsequent TMA(s).
- (3 marks)

You should write no more than **250 words** for Question 1(a).

- b.
- i. A sine wave has a *period* (duration of one cycle) of 47.5 μs. What is the corresponding frequency of this sine wave in kHz, expressed to 3 significant figures? (See Study note 7.1 in the ‘Using numbers (maths)’ booklet.)
- (4 marks)
- ii. If the frequency of the sine wave is now increased by a factor of 2.45, what will be the new *period* value? Give your answer in μs to 3 significant figures.
- (4 marks)

**Note:** to avoid rounding errors in your calculations, use the full frequency value from the first part, not the rounded value to 3 significant figures.

c. In a high-quality coaxial cable, the power drops by a factor of 10 approximately every 2.35 km. Given a transmit power of 0.28 W ( $2.8 \times 10^{-1}$  W), construct a table (like Table 1.2 in Section 1.4.4 of Block 3) showing how the signal power (in W) changes in distance intervals of 2.35 km.

Now using this table, what is the distance from the transmitter at which the signal power is attenuated to 2.8 μW?

- (7 marks)
- d. Express the following 48-bit binary MAC address in hexadecimal (see the ‘Using numbers (maths)’ booklet).

**01100010 – 11101001 – 11110001 – 11000111 – 10101011 – 01011101**

- (8 marks)

### Question 2 (30 marks)

a.

i. The design requirements for a Bluetooth 5.0 *personal area network* are to deploy devices with minimal power and a radio range up to 7.5 m. Explain which Bluetooth class you would select, providing a clear rationale for your choice (see Section 3.5.2)

(3 marks)

ii. Both Bluetooth and Wi-Fi offer wireless communication between multiple devices. Based on what you have learnt in Section 3.5, *in your own words*, compare the benefits and limitations of these technologies in terms of their bitrate, radio range and power output. Where appropriate, include in your answer indicative values and example scenarios for each.

The word limit for part (ii), is **120 words** and your answer must NOT be a comparison table.

- (7 marks)

b.

i. A *base station* (BS) for mobile communications in an urban environment has a power measurement of 27 μW at 330 m. If the propagation follows an *inverse cube power law* (Section 3.2.2), what is a reasonable power value, in μW, to assume 1.32 km from the BS?

Express your answer in scientific notation to 2 decimal places.

- (5 marks)
- ii. If, while travelling, the mobile phone app you have installed displays a received signal strength of 216 nW, how far in metres are you from the BS? You should assume the same propagation law as in part (i). Give your answer in scientific notation to 2 decimal places.

**Hint:** see Activity 3.6 and Tables 3.1 & 3.5.

- (5 marks)

c.

i. A *time division multiplexing* (TDM) channel link (Section 3.4.2) transmits the speech signals of 48 users. If each individual speech signal has a bandwidth of 4 kHz and is digitised according to the *sampling theorem* (Section 3.3.1), what is the minimum sampling rate for one speech signal?

(2 marks)

ii. If each speech sample is quantised into 256 levels, with 1 extra bit per sample then added for TDM synchronisation purposes, calculate the *bitrate* in kbps for a single speech signal. Express your answer in scientific notation to 1 decimal place.

**Hint:** you firstly need to determine the number of bits per speech sample that allow for 256 quantisation levels (see Sections 2.4 (Block 1) and 3.3.2 (Block 3)), before then adding the extra bit for synchronisation.

- (5 marks)
- iii. Hence, determine the total *bitrate* for all the user speech signals on this TDM channel link, expressing your answer in Mbps to 2 decimal places.
- (3 marks)

### Question 3 (30 marks)

a. In this part of Question 3, you will contribute a resource to a wiki and then comment on a resource contributed by another student. Make sure that you contribute your resource **at least five days before the TMA deadline** (i.e. by 23:59 on 6 September 2025) so that other students have an opportunity to read and comment on it.

i. In Block 3, Part 5, Activity 5.12, you found a web resource and added a section about it to a wiki. Now that you have studied Part 6 of Block 3, find a web resource that you think is interesting and relevant specifically to Part 6. Add a section about this resource to the [TM111 TMA 03 tutor group wiki](#). To do this, follow the instructions below, which you will also find on the Start page of the wiki.

Follow the link (at the bottom of the Start page) to the ‘page for sharing resources’. You can edit the new page to share resources with other students in your tutor group and comment on their resources. You cannot edit the Start page. On the page for sharing resources, add a new section (using the ‘Add new section’ button near the bottom of the page).

In your new wiki section, you should include a link to your chosen resource, a short explanation of what the resource is about, and an explanation of why it is interesting and how it is relevant to Part 6.

The word limit for Question 3(a)(i) is **150 words**.

As your answer to Question 3(a)(i):

◦ paste a copy of the text in your wiki section into your TMA document

◦ take a screenshot showing your wiki section and paste it into your TMA document.

**(6 marks** if contributed five days before TMA deadline; **3 marks** otherwise)

ii. Choose a section of the wiki, contributed by another student, that you find interesting. Using the wiki’s ‘Edit section’ facility, add a comment to the wiki section that you chose, explaining why it is of interest to you.

The word limit for Question 3(a)(ii) is **100 words**.

Precede your comment with ‘A comment from [your name]’ so that your tutor and other students can tell who the comment is from.

As your answer to Question 3(a)(ii):

◦ paste a copy of your comment into your TMA document

◦ take a screenshot showing your comment in the wiki section and paste it into your TMA document.

**(3 marks)**

iii. Write a short piece of text about your experience of the wiki’s usability. You should relate your answer to **three** of the following concepts that you learnt about in Block 1, Part 6.5.1 ‘What is usability?’:

- effectiveness

◦ efficiency

◦ satisfaction

◦ learnability

◦ recoverability.

The word limit for Question 3(a)(iii) is **250 words**.

**(6 marks)**

b. The following BBC News article, from November 2024, discusses concerns about children being exposed to unsuitable online material, particularly via social networking sites.

[‘It’s so easy to lie’: A fifth of children use fake age on social media \(McMahon, Singleton & Hayes, 2024\)](#)

There is a need for reliable and accurate age verification of users when they register for certain websites. The following resource, from the Age Verification Providers Association (AVPA), outlines the different ways in which this can be achieved, including the use of facial biometric analysis.

[How do you check age online? \(AVPA, 2025\)](#)

Click on the link titled ‘Age estimation via biometric analysis’ to read about this approach.

Now find **one additional web resource** which, together with those above, will help you to answer the following questions:

- Why is it important for online sites, such as social media, to verify the age of a user?

◦ How can biometric facial analysis be used to verify age?

◦ What is the role of Artificial Intelligence (AI) in this process?

◦ How accurate is age verification using biometric facial analysis?

i. Write a short piece of text, **in your own words**, to answer these four questions. You should write your answer as a flowing narrative of sentences and paragraphs (not as notes, bullet points or tables). Your writing should be clear and well structured, with correct spelling, punctuation and grammar.

**(10 marks)**

ii. Provide a link, title and date (if possible) for your additional web resource. Then explain how you found it. For example, if you used a search engine, which search engine and search terms did you use? If you used an AI tool, which tool and ‘prompts’ did you use?

**(5 marks)**

The overall word limit for Question 3(b) is **400 words**. Use the marks for each part as a guide to how much to write for that part.

### Question 4 (10 marks)

You should have completed your PDP action plan form as part of Activity 6.21 in Block 1, Part 6, and submitted it in TMA 02. You will find it helpful to revisit [Steps 4 and 5 ‘Reviewing your goals and action plan’](#) before answering this question.

Your tasks for this question are to:

• review and reflect on your progress in relation to the PDP action plan (which you submitted as part of TMA 02)

• comment briefly on the knowledge and skills that you have gained as a result of your studies

• assess your progress towards your goals (and if your goals have changed, you should also state how and why they have changed).

You should use the [PDP action plan review template](#) for this purpose, and you should then make an updated version of your [PDP action plan form](#).

Your commentary must include the goal(s) related to improving your learning or study skills while studying TM111.

For this question, you should submit your completed PDP action plan review template and your latest PDP action plan form.

### What to include in your zip file for TMA 03

Your zip file for TMA 03 should contain:

• your TMA document in either .doc, .docx or .rtf format

• your completed PDP action plan review template

• your latest PDP action plan form.

Compress all the files into one zip file and submit it through the online TMA/EMA service. Please note that only files with the .zip extension are acceptable.

### TMA 03 checklist

Have I ...	Yes	No, what should I do?
read the <i>TM111 Assessment guide</i> ?		Look at the guide, paying particular attention to the section ‘How to pass the module’.
read the guidance notes for this assignment?		Read all the notes at the beginning of the TMA.
shown my working for numerical questions?		For Questions 1 and 2, demonstrate how you worked out your answers, as well as giving the answers.
contributed a resource to the wiki?		For Question 3(a), contribute your resource at least five days before the TMA deadline.
shown a word count for questions with a word limit?		Check the word count for your answer and include it below the answer.
written clearly, in my own words, with correct spelling, punctuation and grammar?		Check that you have not copied from the module materials or external resources. Read through your answers to check that your writing is clear and correct. Use a spellchecker if you like.
included the necessary files in the zip file?		Check the section ‘What to include in your zip file for TMA 03’.

### References

Age Verification Providers Association (2025) ‘How do you check age online?’. Available at: <https://avpassociation.com/avmethods/> (Accessed 14 February 2025).

McMahon, L., Singleton, T. & Hayes, G. (2024) ‘‘It’s so easy to lie’’: A fifth of children use fake age on social media’, BBC News, 28 November. Available at: <https://www.bbc.co.uk/news/articles/cn4v52ezx17g?> (Accessed 14 February 2025).