



# TUS

**Technological University of the Shannon:  
Midlands Midwest**

Ollscoil Teicneolaíochta na Sionainne:  
Lár Tíre Iarthar Láir

**TECHNOLOGICAL UNIVERSITY OF THE SHANNON: MIDLANDS MIDWEST**

## **SAMPLE EXAMINATIONS 2021/2022**

**MODULE:** MATH06050-32720 - Mathematics for Software Design 1.1

**PROGRAMME(S):**

AL_KSVRG_8	Bachelor of Science (Honours) in Software Design with Virtual Reality and Gaming
AL_KSVRG_7	Bachelor of Science in Software Design with Virtual Reality and Gaming
AL_KMOBA_8	Bachelor of Science (Honours) in Software Design with Mobile Apps and Connected Devices
AL_KMOBA_7	Bachelor of Science in Software Design with Mobile Apps and Connected Devices
AL_KAICC_8	Bachelor of Science (Honours) in Software Design with Artificial Intelligence for Cloud Computing
AL_KAICC_7	Bachelor of Science in Software Design with Artificial Intelligence for Cloud Computing
AL_ESFTW_6	Higher Certificate in Science in Software Design

**YEAR OF STUDY:** 1

**EXAMINER(S):**

Dr. Mark Daly (Internal)

**TIME ALLOWED:** Refer to Guidelines on Page 3 of this exam.

**INSTRUCTIONS:** Answer all questions.

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**MAKE SURE YOU HAVE RECEIVED THE CORRECT EXAM PAPER. PLEASE DO NOT TURN OVER THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO.**

The use of programmable or text storing calculators is expressly forbidden.

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*Requirements for this paper:*

- 1. Log Tables*
- 2. Graph Paper*

## **Alternative Terminal Assignments Document Submission Cover Sheet**

*Please ensure that you complete all relevant sections below and that you make this the **first page** of your Alternative Terminal Assignments submission.*

*For submission, you are required to put all aspects of the **Alternative Terminal Assignments** into one document, including the cover sheer below and then to submit the assignment on Moodle in the relevant module location.*

*The assignment must be completed on or before the designated submission date and time. Students are recommended to keep a copy of the assignment, as submitted.*

*Please complete the following, in advance of submission.*

*If for some reason you cannot complete this form to attach to your assessment, please hand write the details, photograph and upload to Moodle.*

<b>Student Number</b>	<b>Programme Title:</b>	
<b>Programme Year:</b>		<b>Module Title:</b>
<b>Lecturer Name:</b>		
<b>Number of questions answered:</b>		
<b>Please list the Question numbers attempted:</b>		
<b>Declaration of Authenticity:</b> <i>By uploading this document, I confirm that the attached alternative terminal assignment is original and represents all my own work.</i>		

## **GUIDELINES**

**Read these guidelines thoroughly**

### **Submission Date/Time**

- This assignment is designed to be completed 2 hours.
- The Moodle submission window is 4 hours.

### **Submission Format**

- The submission must be handwritten on ruled A4 paper.
- Use graph paper when plotting the functions in Question 1.
- All submissions must be accompanied by an original printed, signed, and dated Institute Alternative Terminal Assignments (ATA) Document Submission Cover Sheet form. Submissions without this signed form will not be accepted. **This form is on page 2 of this exam.**
- If you don't have access to a printer then hand write (on an A4 sheet) the text on the ATA cover sheet form (in block capitals) and then sign and date it. This should also be scanned and inserted into the word document.
- The handwritten sheets must be scanned (via a scanner) or photographed (via your smartphone) and then imported into a single Word/OpenOffice/LibreOffice/PDF document which is then submitted.
- If using a smartphone, it might help to email the photos to your college, or personal, email and then download the photos onto your PC for importing into Word/OpenOffice/LibreOffice/PDF
- When collating the pages, keep them in order and ensure that the ATA Cover sheet form is first, followed by the pages (in order) with your solutions.
- When scanning/photographing the pages, take appropriate measure to ensure their clarity and legibility.
- The assignment is to be submitted on the AL\_KSVRG\_8\_1 Maths for Software Design 1.1 page only.

### **Other Information**

- This is an individual assignment. The procedures governing Plagiarism apply to this assignment and any suspected breaches will be dealt with in line with Institute policies.
- This alternate terminal assignment is worth 60% of the total mark allocated for this module.
- **THERE WILL BE NO EXTENSIONS TO THE DEADLINE.**
- **LATE SUBMISSIONS WILL NOT BE ACCEPTED.**

**QUESTION 1****[TOTAL MARKS: 20]**

For each of the following functions:

- (i) Graph the function in the specified interval
- (ii) Estimate the value(s) of  $x$  where the graph crosses the horizontal axis
- (iii) Estimate the turning points(s) of the function in the interval.

**Q 1(a)****[10 Marks]**

$$f(x) = x^2 + 3x - 4 \text{ on the interval } [-6, 3]$$

**Q 1(b)****[10 Marks]**

$$f(x) = x^3 + 3x^2 - 4x - 5 \text{ on the interval } [-5, 3].$$

**[End of Question 1]****QUESTION 2****[TOTAL MARKS: 20]****Q 2(a)****[6 Marks]**

Determine all values of  $x$  for which the matrices below are non-singular:

$$(i) \begin{pmatrix} 1 & 0 & 1 \\ x & -1 & 2 \\ 4 & 1-x & 1 \end{pmatrix} \quad (ii) \begin{pmatrix} 6-x & 2 & 1 \\ 0 & 4-x & 7 \\ 0 & 0 & 8+x \end{pmatrix}$$

**Q 2(b)****[12 Marks]**

Calculate the inverse of the following matrix:

$$\begin{pmatrix} 1 & -1 & 2 \\ 2 & 1 & 6 \\ 1 & -4 & -2 \end{pmatrix}$$

**Q 2(c)****[2 Marks]**

Solve the system of linear equations:

$$\begin{aligned} x - y + 2z &= 0 \\ 2x + y + 6z &= 4 \\ x - 4y - 2z &= -2 \end{aligned}$$

**[End of Question 2]**

**QUESTION 3****[TOTAL MARKS: 20]**

Differentiate each of the following functions of  $x$  with respect to  $x$ :

**Q 3(a)****[5 Marks]**

$$f(x) = (\cos^2(x) + \sin^2(x)) \cos(2x)$$

**Q 3(b)****[5 Marks]**

$$f(x) = \ln|e^{\sin(x)} - 3x|$$

**Q 3(c)****[5 Marks]**

$$f(x) = \sin(\cos(\tan(e^{4x})))$$

**Q 3(d)****[5 Marks]**

$$f(x) = \frac{x^5 - 1}{x^4 + x^3 + x^2 + x + 1}$$

**[End of Question 3]****[END OF EXAM]**