**XJTLU Entrepreneur College (Taicang) Cover Sheet**

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| Module code and Title | **DTS104TC Numerical Methods** | |
| School Title | **School of Artificial Intelligence and Advanced Computing** | |
| Assignment Title | **Assignment 2** | |
| Submission Deadline | **June 2, 2021. 5pm (GMT+8)** | |
| Final Word Count | **-** | |
| If you agree to let the university use your work anonymously for teaching and learning purposes, please type **“yes”** here. | |  |

I certify that I have read and understood the University’s Policy for dealing with Plagiarism, Collusion and the Fabrication of Data (available on Learning Mall Online). With reference to this policy I certify that:

* My work does not contain any instances of plagiarism and/or collusion.  
  My work does not contain any fabricated data.

**By uploading my assignment onto Learning Mall Online, I formally declare that all of the above information is true to the best of my knowledge and belief.**

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| --- | --- | --- | --- | --- | --- | --- |
| **Scoring – For Tutor Use** | | | | | | |
| **Student ID** | | | |  | | |
|  | | | | | | |
| **Stage of Marking** | | **Marker**  **Code** | **Learning Outcomes Achieved （F/P/M/D）**  **(please modify as appropriate)** | | | **Final**  **Score** |
| **A** | **B** | **C** |
| 1st Marker – red pen | |  |  |  |  |  |
| Moderation  – green pen | | **IM**  **Initials** | The original mark has been accepted by the moderator (please circle as appropriate): | | | Y / N |
|  | Data entry and score calculation have been checked by another tutor (please circle): | | | Y |
| 2nd Marker if needed – green pen | |  |  |  |  |  |
| **For Academic Office Use** | | | **Possible Academic Infringement (please tick as appropriate)** | | | |
| **Date**  **Received** | **Days late** | **Late Penalty** | **☐ Category A** | | Total Academic Infringement Penalty (A,B, C, D, E, Please modify where necessary) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
|  |  |  | **☐ Category B** | |
| **☐ Category C** | |
| **☐ Category D** | |
| **☐ Category E** | |

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| **Module** | **EXAMINER** | **DEPARTMENT** | **Email** |
| DTS104TC | Long Huang | School of Intelligent Manufacturing Ecosystem | Long.Huang@xjtlu.edu.cn |

**2nd SEMESTER 2020/21 Assignment**

**Undergraduate – Year 2**

**DTS104TC Numerical Methods**

**Submission Deadline: June 2, 2021. 5pm (GMT+8)**

**INSTRUCTIONS**

1. **The weighting of this assignment is 20% of the final mark.**
2. **The marking criteria sheet is provided as a supplementary document.**
3. **Your submission should only be in English.**
4. **Answers to questions should be typed on A4 pages as Word files. The assignment must be submitted in Word via Learning Mall Online to the correct drop box. Only electronic submissions are accepted and no hard copy submissions are permitted.**
5. **All students must download their file and check that it is viewable after submission. Documents may become corrupted during the uploading process (e.g. due to slow internet connections). However, students themselves are responsible for submitting a functional and correct file for their assessments.**

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| **Student Name** | **Student ID** |
|  |  |
| **DEPARTMENT** | **Email** |
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***Question – 1 (40/100)***

Consider the following equation: Equation (1)

|  |  |
| --- | --- |
|  | (1) |

Assuming stability is not an issue and all methods will converge, Select the best-suited root finding technique out of Bisection Method, Newton-Raphson and Secant Method.

1. Justify your selection of method based on by comparing number of guesses needed, rate of convergence and whether the required evaluation of the differentiation can be obtained. (20 marks)
2. For your selected method, present your calculations with the stopping criterion set to 5%. For each iteration, show the approximation of the root and the relative error. For Bisection and Secant Method, set initial guesses as 0.5 and 2. For Newton-Raphson method, set initial guess as 1.2. (20 marks)

Submission requirements:

* Type your calculations for each iterations.
* Fill out Table-1 with your answers. Based on number of iterations needed, add or delete rows if necessary.

Table-1

|  |  |  |
| --- | --- | --- |
| Iteration | Approximation of root  ( 4 decimal places) | Relative Error  (% with two decimal places) |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |

***Question – 2 (60/100)***

Evaluate the integral in Equation (2).

|  |  |
| --- | --- |
|  | (2) |

1. Analytically; (10 Marks)
2. Single application of the trapezoidal rule; (10 Marks)
3. Multiple-application of the trapezoidal rule (n=2); (10 Marks)
4. Multiple-application of the trapezoidal rule (n=4); (10 Marks)
5. Single application of the Simpson’s 1/3 rule; (10 Marks)
6. Single application of the Simpson’s 3/8 rule. (10 Marks)

Submission requirements:

* Type your calculations for each iterations.
* For non-analytical methods, calculate the relative error based on analytical solution.
* Fill out Table-2 with your answers.

Table-2

|  |  |  |
| --- | --- | --- |
| Method | Approximation  ( 2 decimal places) | Relative Error  (% with two decimal places) |
| Analytical |  | N/A |
| Single application of the trapezoidal rule |  |  |
| Multiple-application of the trapezoidal rule (n=2) |  |  |
| Multiple-application of the trapezoidal rule (n=4) |  |  |
| Single application of the Simpson’s 1/3 rule |  |  |
| Single application of the Simpson’s 3/8 rule |  |  |

END OF QUESTIONS

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**LEARNING OUTCOMES**

This assessment tests your ability to:

A. Apply numerical methods in a number of different contexts.

B. Solve systems of linear and nonlinear algebraic equations to specified precision.

E. Develop quadrature methods for numerical integration.

**MARKING CRITERIA**

The following table indicates what is expected for each classification category, highlighting generic marking criteria that bring together expectations in performance for each percentage (or alphabetical) band and the criteria that need to be satisfied.

**Generic Marking Criteria**

|  |  |  |  |
| --- | --- | --- | --- |
| **Grade** | **Point Scale** |  | **Criteria to be satisfied** |
| A | 81+ | First | * Outstanding work that is at the upper limit of performance. * Work would be worthy of dissemination under appropriate conditions. * Mastery of advanced methods and techniques at a level beyond that explicitly taught. * Ability to synthesise and employ in an original way ideas from across the subject. * In group work, there is evidence of an outstanding individual contribution. * Excellent presentation. * Outstanding command of critical analysis and judgment. |
| B | 70 - 80 | First | * Excellent range and depth of attainment of intended learning outcomes. * Mastery of a wide range of methods and techniques. * Evidence of study and originality clearly beyond the bounds of what has been taught. * In group work, there is evidence of an excellent individual contribution. * Excellent presentation. * Able to display a command of critical thinking, analysis and judgment. |
| C | 60 - 69 | Upper Second | * Attained all the intended learning outcomes for a module or assessment. * Able to use well a range of methods and techniques to come to conclusions. * Evidence of study, comprehension, and synthesis beyond the bounds of what has been explicitly taught. * Very good presentation of material. * Able to employ critical analysis and judgement. * Where group work is involved there is evidence of a productive individual contribution |
| D | 50- 59 | Lower Second | * Some limitations in attainment of learning objectives but has managed to grasp most of them. * Able to use most of the methods and techniques taught. * Evidence of study and comprehension of what has been taught * Adequate presentation of material. * Some grasp of issues and concepts underlying the techniques and material taught. * Where group work is involved there is evidence of a positive individual contribution. |
| E | 40 - 49 | Third | * Limited attainment of intended learning outcomes. * Able to use a proportion of the basic methods and techniques taught. * Evidence of study and comprehension of what has been taught, but grasp insecure. * Poorly presented. * Some grasp of the issues and concepts underlying the techniques and material taught, but weak and incomplete. |
| F | 0 - 39 | Fail | * Attainment of only a minority of the learning outcomes. * Able to demonstrate a clear but limited use of some of the basic methods and techniques taught. * Weak and incomplete grasp of what has been taught. * Deficient understanding of the issues and concepts underlying the techniques and material taught. * Attainment of nearly all the intended learning outcomes deficient. * Lack of ability to use at all or the right methods and techniques taught. * Inadequately and incoherently presented. * Wholly deficient grasp of what has been taught. * Lack of understanding of the issues and concepts underlying the techniques and material taught. * Incoherence in presentation of information that hinders understanding. |
| G | 0 | Fail | * No significant assessable material, absent, or assessment missing a “must pass” component. |