

**ASSESSMENT FORM**

**Course: MATH6192031 – Scientific Computing**

**Method of Assessment: Case Study**

**Semester/Academic Year : Even/2023-2024**

**Name of Lecturer : Dr. Dany Eka Saputra, M.Eng.**  
**Date : 05 Feb – 22 Jun 2024**  
**Class : Computer Science**  
**Topic : Regression & Interpolation, Taylor Series, Root of Equations**

<b>Group Members :</b>	1	_____
	2	_____
	3	_____
	4	_____
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	7	_____
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**Student Outcomes:**

(SO 1) Mampu menganalisis masalah komputasi yang kompleks dan mengaplikasikan prinsip komputasi dan keilmuan lain yang sesuai untuk mengidentifikasi solusi.

*Able to analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions*

**Learning Objectives:**

(LObj 1.1) Mampu menganalisis masalah komputasi yang kompleks

*Able to analyze a complex computing problem*

(LObj 1.2) Mampu menerapkan prinsip komputasi dan disiplin ilmu terkait lainnya untuk mengidentifikasi solusi

*Able to apply principles of computing and other relevant disciplines to identify solutions*

**Learning Outcomes :**

(LO 1) Melakukan komputasi saintifik dasar menggunakan Python

*Compute basic scientific computation using Python*

(LO 2) Menyelesaikan Sistem Persamaan Linear, Regresi dan Interpolasi menggunakan komputasi saintifik

*Solve the System of Linear Algebraic Equations, Regression and Interpolation through scientific computation*

(LO 3) Mengevaluasi penerapan Deret Taylor dan Akar Persamaan dalam komputasi saintifik

*Evaluate the application of Taylor Series and Root of Equations in scientific computation*

No	Related LO- LOBJ-SO	Assessment criteria	Weight	Excellent (85 - 100)	Good (75-84)	Average (65-74)	Poor (0 - 64)	Score	(Score x Weight)
1	LO2- L.Obj.1.2- SO1	Ability to solve regression and interpolation problems through scientific computation	30%	Able to solve in both numerical and computational approaches well without errors.	Able to solve both in numerical and computational approaches well with some errors.	Able to solve either in numerical or computational approaches well with some errors.	Unable to solve in either numerical nor computational approaches.	100	30
2	LO3- L.Obj.1.1- SO1	Ability to examine the application of the Taylors Series in scientific computation.	25%	The examination result is accurate, clear and complete.	The examination result is accurate, clear but incomplete.	The examination result is accurate, but not clear and incomplete.	The examination result is not accurate, not clear, and incomplete.	100	25
3	LO3- L.Obj.1.1- SO1	Ability to examine the application or root equations in	25%	The examination result is accurate, clear and complete.	The examination result is accurate,	The examination result is accurate, but not clear and incomplete.	The examination result is not accurate,	100	25

No	Related LO- LOBJ-SO	Assessment criteria	Weight	Excellent (85 - 100)	Good (75-84)	Average (65-74)	Poor (0 - 64)	Score	(Score x Weight)
		scientific computation.			clear but incomplete.		not clear, and incomplete.		
4	LO1- L.Obj.1.2- SO1	Ability to compute basic Python programming in assigning appropriate variables, data structure, function, statements and libraries	20%	The computation is correct, and can work well without errors.	The computation is correct and can work well with some errors.	The computation is correct but cannot work well.	The computation is incorrect and cannot work well.	100	20
	<b>Total Score:</b> $\sum(\text{Score} \times \text{Weight})$								100

Remarks:

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## ASSESSMENT METHOD

### Instructions for Students:

1. Answer each questions in separate documents, according to each question specified document type.
2. All numerical answer in floating point must be provided as three-digits precision ( $\times 10^{-3}$ ).
3. The usage of any Python libraries that provide direct function to solve a problem is allowed, however, answer with minimum uses of such libraries are rated higher.
4. This case study is consist of several open questions, which mean that each question can be answered by using different method. You'll need to decide yourself which method is suitable for each question. You **MUST** provide the reason on choosing the method in your answer.
5. You are encouraged to provide a graph to explain your answer.
6. Write each answer is a clear and concise manner. Make sure that all the equations or calculations is readable and in correct order.
7. **DO NOT** use hand-writing in any part of your answer.
8. Your answer will be checked for similarity with other student's answer. Any similarity greater than 20% (for each answer) will result in automatic 0 (zero) points. The similarity is checked against the answer from other class answer as well.

### Case Study:

You are working as a Data Scientist in EGIER, an outdoor equipment manufacturer in Bandung. As a Data Scientist, you have been tasked with processing some data on EGIER warehouse capacity. You are given a set of data that consist of the monthly production of a certain type of bag they produced. The data span from January 2018 to December 2023 (given as M1 to M144). The data is given in CSV (comma-separated value) document, and you can access the document here: [https://binusianorg-my.sharepoint.com/personal/dany\\_eka\\_binus\\_ac\\_id/\\_layouts/15/guestaccess.aspx?share=EVhWhA\\_FvLpPosc5pugftdQBc94JdfagoiDYPSK-WgKcjQ&e=txatkv](https://binusianorg-my.sharepoint.com/personal/dany_eka_binus_ac_id/_layouts/15/guestaccess.aspx?share=EVhWhA_FvLpPosc5pugftdQBc94JdfagoiDYPSK-WgKcjQ&e=txatkv) . Your supervisor has given you a series of task that needs to be done on the data, as a part or your job. These are what your supervisor wants you to do:

1. **(LO2 30 points)** You must find the trend on the bag's production from the data. You must provide a mathematical model that can explain the production's trend accurately. Since your supervisor want an accurate model, you must avoid any linear approach to build the trend model.
2. **(LO3 25 points)** Since you'll need to process the data using a computer program, you'll need to convert the mathematical model from problem #1 to its numerical form (approximation). This is done so that the mathematical model can be calculated by the program easily. Since accuracy is

still important, make sure that your conversion is accurate as possible. Provide an explanation to your supervisor about the accuracy of your conversion.

3. **(LO3 25 points)** The warehouse was designed to be able to store a maximum of 25,000 (twenty five thousands) bags at each month. Your supervisor asked you to provide a prediction when do EGIER need to build a new warehouse based on the trend that you have acquired in problem #2. To build a new warehouse, it is predicted that they need at least 13 months. So provide the time when EIGER need to start building their new warehouse. (**Hint:** this can be approached as a root of equation problem).
4. **(LO1 20 points)** Your supervisor want to double check your result. Provide the code that you have used to answer problem #1 to #3. Provide your code as a Python script file (.py extension).

**Note for Lecturers:**

1. Provide evaluation for each question separately.
2. Refers to the given rubric to evaluate the student's answer.
3. Each question can be solve by using different methods. Please evaluate the logic and process to reach the result, not the result itself.