Module 2 Assessment - Part 2 (incl. MATLAB)

You have 6 monthly measurements of the height of a point on a glacier. The measurements are obtained from a satellite laser altimeter.

Time [months]: $[0,\ 1,\ 2,\ 3,\ 4,\ 5]$

Observed heights [meters]: $[100.9,\ 99.6,\ 98.7,\ 99.9,\ 100.3,\ 98.5]$

We will consider four different functional models, with the following observation equations:

Model 1: zero-order polynomial: $E\{\underline{y}_i\} = x_0$

Model 2: second order polynomial: $E\{\underline{y}_i\} = x_0 + x_1 t_i + x_2 t_i^2 = \sum_{p=0}^{2} x_p t_i^p$

Model 3: fifth order polynomial: $E\{\underline{y}_i\} = \sum_{p=0}^{5} x_p t_i^p$

Model 4: $E\{\underline{y}_i\} = x_0 + x_1 \cdot t_i + x_2 \cos\left(\frac{2\pi t_i}{12}\right)$

- 4. Best Linear Unbiased Estimation (BLUE)
- Pre-knowledge Mathematics
- MATLAB Learning Content

MATLAB ASSIGNMENT GLACIER MODEL (EXTERNAL RESOURCE)

Glacier model

You will now define the A-matrix for each of the four models of the height change of a point on a glacier (see introduction above).

What is the redundancy for each model?

Your Solution

Save Reset MATLAB Documentation (https://www.mathworks.com/help/)

```
%% times of observation [months]
t = [0 1 2 3 4 5]';
%% observed heights [m]
y = [100.9 99.6 98.7 99.9 100.3 98.5]';

%% number of observations
m  = length(t);

%% design matrices for the four models [complete the code on all 4 lines below]
A1 = ones(6, 1)
A2 = [A1, t, t.^2]
A3 = [A1, t, t.^2, t.^3, t.^4, t.^5]
A4 = [A1, t, cos(2*pi*t/12)]

%% what is the redundancy with each model? [complete the code on all 4 lines belo
r1 = 5
r2 = 3
r3 = 0
r4 = 3


```

Run Submit for Assessment

Glacier model - questions

2/2 points (graded)

What is the redundancy of each model?

Redundancy model 1:

5

✔ **Answer:** 5

5

Redundancy model 2:

3

✔ **Answer:** 3

3

Redundancy model 3:

0

✔ **Answer:** 0

0

Redundancy model 4:

3 ✔ **Answer:** 3

3

Submit You have used 1 of 2 attempts

✔ Correct (2/2 points)

Glacier model - questions (cont'd)

2/2 points (graded)

Which of the following statements is true? *Select all correct answers.*

- ☐ All models are overdetermined
- ☑ None of the models is underdetermined
- ☑ Model 3 will have a unique solution
- ☐ The stochastic model for each model will different

✔

Submit You have used 1 of 2 attempts

✔ Correct (2/2 points)