Project-MTH686
Non-Linear Regression Analysis

Due date is 12.11.25, 7 p.m. No extension and no consultation with your frineds. If I find similar copies all will get zero mark. It has to be submitted in typed hard copy maximum page limit is 6 (three pages printed both sides). Just staple it and put it in my mailbox. Do not use any folder. All the programs you should put as appendix and submit it through e-mail: kundu.debasis@gmail.com. The codes should be verifiable. Send an e-mail to me (kundu@iitk.ac.in) and you will get the data set within 36 hours.

1. Consider the data set you receive in your e-mail, which is of the form $(t, y(t))$. It is coming from one of the three modes:
Model 1:

$$y(t) = \alpha_0 + \alpha_1 e^{\beta_1 t} + \alpha_2 e^{\beta_2 t} + \epsilon(t).$$

Model 2:

$$y(t) = \frac{\alpha_0 + \alpha_1 t}{\beta_0 + \beta_1 t} + \epsilon(t).$$

Model 3:

$$y(t) = \beta_0 + \beta_1 t + \beta_2 t^2 + \beta_3 t^3 + \beta_4 t^4 + \epsilon(t).$$

Let us assume that $\{\epsilon(t)\}$ is a sequence of *i.i.d.* normal random variable with mean zero and variance σ^2. Analyze the data keeping the following points in mind, and write a report based on that.

1. Find the least squares estimators of the unknown parameters under three different model assumptions.
2. How did you find the least squares estimators? What kind of initial guesses you have chosen?
3. Find the 'best' fitted model.
4. Find the estimate of σ^2.
5. Find the associated confidence intervals based on the Fisher information matrix.
6. Plot the residuals.
7. Test whether it satisfies the normality assumption or not?
8. Plot the observed data points and fitted curve.