NANYANG TECHNOLOGICAL UNIVERSITY
SCHOOL OF CIVIL AND STRUCTURAL ENGINEERING

CV272 – NUMERICAL METHODS

Tutorial 3: Linear Regression and Curve Fitting

1. Stopping distances Y were recorded in metres for cars travelling at various speeds X km/h:

Table Q1

X	8	30	50	70	90
Y	1.8	5.7	14.5	22.1	31.2

For these data in Table Q1, fit (a) a straight line and (b) a 2nd degree polynomial.
(Ans. (a) $y = -3.17 + 0.368\,x$ (b) $y = -0.298 + 0.188x + 0.00184\,x^2$)

2. Ultrasonic pulse velocity technique is a non-conservative method to evaluate concrete strength of existing concrete structures. Strength calibration of this technique for a particular concrete mix is carried out in a laboratory. Table Q2 gives the values of cube strength f_{cu} (N/mm^2) at various pulse velocities V (km/s).

Table Q2

f_{cu}	13.46	14.88	16.44	18.17	20.0
V	4.30	4.47	4.55	4.60	4.73

It has been suggested that the cube strength f_{cu} can be estimated from the pulse velocities using the relationship $f_{cu} = A\,e^{Bv}$. Find the parameters A and B by fitting a regression curve to the observed data in Table Q2. Carry out all your calculations to four decimal places. (Ans. $A = 0.2079;\ B = 0.9646$).

3. At each of 5 tanks, settlement (X_i mm) and differential settlement (Y_i mm) readings were recorded in Table Q3. Weights W_i are to be applied to the square of error of Y_i. Fit a straight line $y = a_o + a_1 x$ to the data:

Table Q3

X	8	11	16	20	24
Y	5	8	10	11	20
W	1	0.53	0.25	0.16	0.11

(Ans. $Y = -0.67 + 0.72\,X$)

TKH/jam
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