Engineering Measurement MDP 141

Assignment 7

Regression and Correlation

Q1: The following data points are expected to follow a functional variation of *y=mx+c*

  - Plot the data on normal scale .

  - Obtain the values of c and m using least square method

- Plot the regression line over the data.

- Predict the y value at x=50 both analytically and graphica

X	Y
10.0	42.0
20.0	57.0
40.0	105.0
60.0	132.0
80.0	180.0
100.0	225.0

Q2: In an experiment to determine the temperature distribution along a length of heated pipe, the following data were recorded :-

Distance from the pipe end mm	100	200	300	400	500
Temperature C°	110	190	290	390	505

a) plot the date.

b) Using the least square method , determine the equation of the linear relation T=a+bL

c) Plot the regression line over the data.

d) Predict the temperature at a distance of 250 mm

Q3: The force deflection data of a certain concrete beam were as follows :-

Applied force (F) KN	100	200	300	400	500
Deflection (δ)mm	1.3	2.4	3.2	4.6	5.0

a) plot the date on linear scale.

b) Using the least square method , determine the equation of the linear relation δ =a+bF

c) Plot the regression line over the data.

e)Predict the deflection correspond to a force of 250 KN an   ically, and

graphically.

Q4: The following data points are expected to follow a certain function

   - Obtain the values of c and m using least square method

- Plot the regression line over the data.

- Predict the y value at x=12 both analytically and graɲ   cally.

X	Y
2.0	8.0
4.0	35.0
5.0	50.0
8.0	120.0
10.0	205.0
15.0	410.0
20.0	780.0

Q5: The following data points are expected to follow a functional variation of $y=ax^b$

X	1.21	1.35	2.40	2.75	4.50	5.10	7.10	8.10
Y	1.20	1.82	5.00	8.80	19.5	32.5	55.0	80.0

It is required to

- Use the method of least squares to obtain the best correlation, (values of a, and b).
- Plot the regression line over the data.
- Determine the value of Y at X=3.

Q6: The following data points are expected to follow a certain function

X	4	5.3	11	21	30	50
Y	105	155	320	580	1050	1900

It is required to

- Use the method of least squares to obtain the best correlation, (values of a, and b).
- Plot the regression line over the data.
- Determine the value of Y at X=10.

Q7: The following data are expected to follow a relation of the form y= a+(b/x)

X	2	10	20	50	100
Y	55	15	10	7	6

-Plot the data on linear scale.

-Predict the relation in accordance to the least square method.

-Plot the regression line

-predict the value of y at x=25, analytically nd graphically..

Q8: The following data are expected to follow a relation of the form y= a+(b/x)

X	10	50	100	250	500	1000
Y	150	110	105	102	101	100

-Plot the data on linear scale.

-Predict the relation in accordance to the least square method.

-Plot the regression line.

-predict the value of y at x=300, analytically and graphicall

Q10: In an Experiment to study the operating characteristics of Pelton turbine, the recorded experimental readings were as follows

No	Turbine speed N (RPM)	Reading of the left spring balance S1 (N)	Reading of the right spring balance S2 (N)
1	2300	0.0	0.0
2	2200	1.5	2.5
3	2000	2.0	3.5
4	1900	2.5	4.5
5	1700	3.0	6.0
6	1300	3.0	7.5
7	1100	3.0	8.5
8	800	3.5	10.0
9	600	3.5	10.5

Draw the conclusion concerning the recorded data

Q11: Write the regression line for the following points, then calculate the correlation coefficient:

x	y
1	4
3	2
4	1
5	0
8	0

Q12: A company wanted to know if there is a significant relationship between the two variables. They collect data as follows.

Variable 1	Variable 2
207	6907
180	5991
220	6810
205	6553
190	6190

Q13: calculate the correlation coefficient for the following

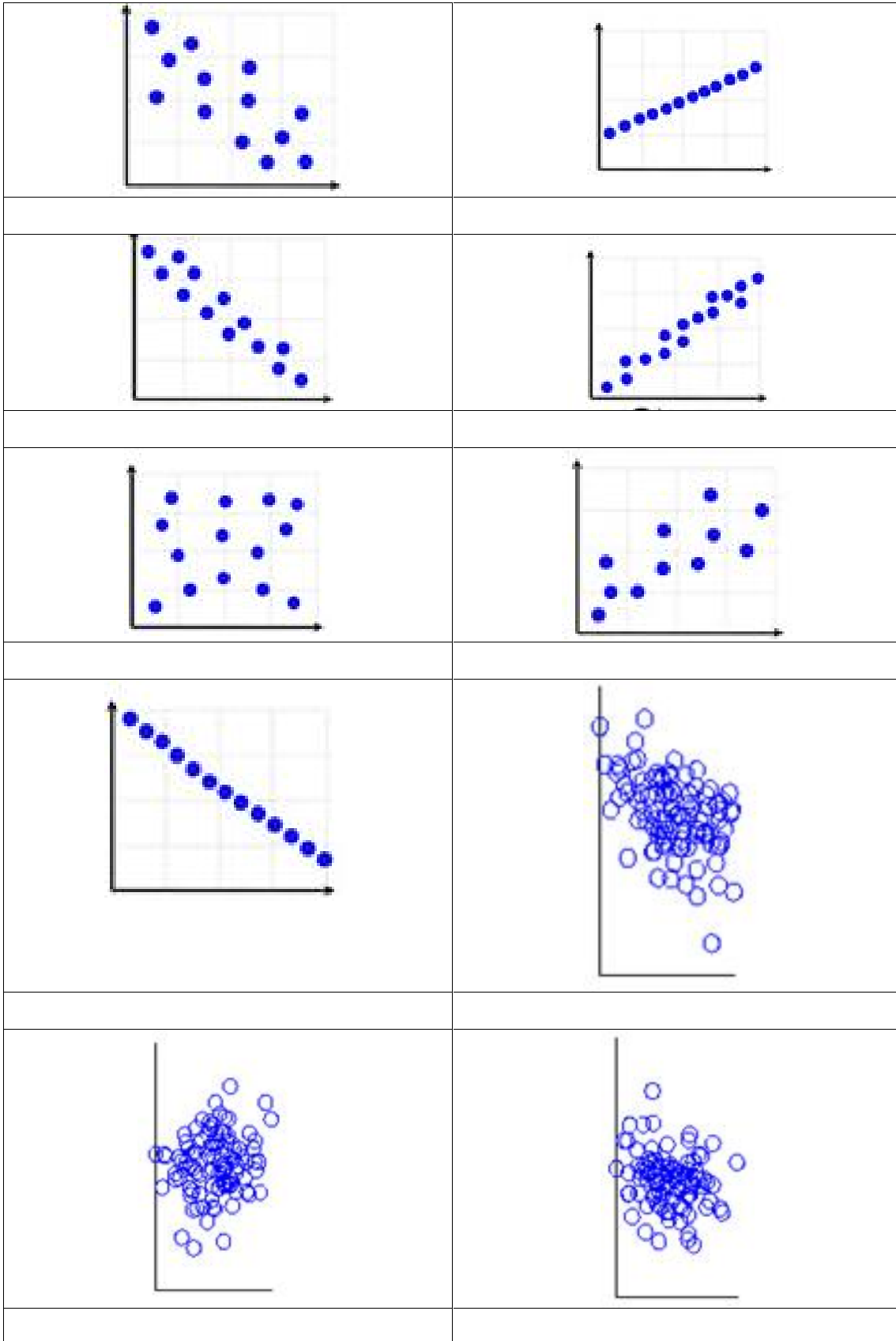| Variable 1	Variable 2
50	155
60	190
74	250
71	200
55	149
58	180
65	185
77	220
72	195
65	180
66	178
68	200

Q14: The following data were recorded for a certain variable; calculate the correlation coefficient then choose the closest one
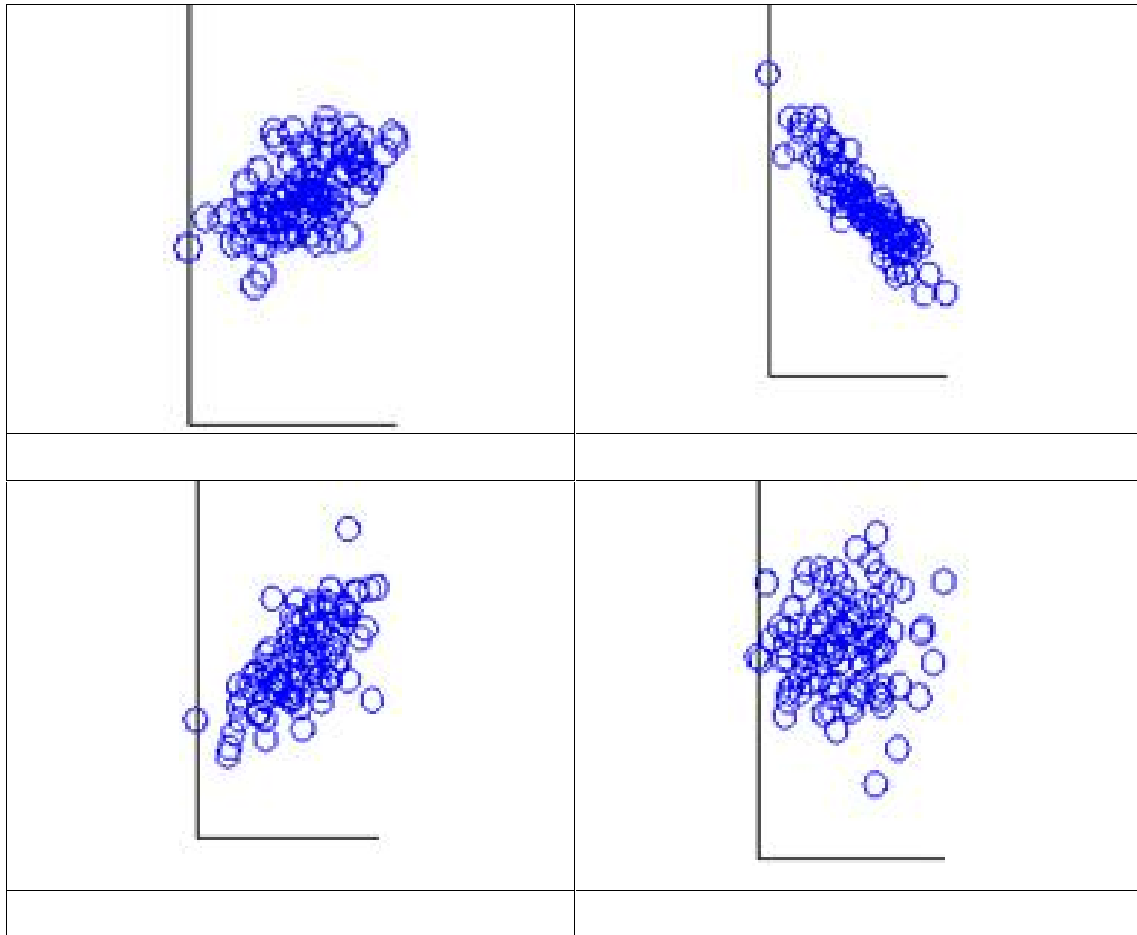
X	4	4	6	5	4
Y	7	3	12	10	4

Approximately

a   0.73   b   1.2   c   0.90   d   0.52

Q15: Without calculation, estimate the correlation coefficient for the following

Q16: In choosing the best physical phenomenon to be used as temperature measuring sensor, three phenomena were used in the study; A, B and C.   The change in each phenomenon with temperature change is recorded as shown in the following table:

Temperature	A	B	C
0	0	0	0
10	1	12	1
20	2.1	26	1.2
30	2.9	30	1.3
40	3.8	41	1.1
50	4.9	55	1.1

60	5.8	61	1.4
80	8.1	79	1.1
100	10	98	1.2

a) Conclude the relationship between the process variable and each of the different phenomenon?

b) Determine the correlation coefficient for each phenomenon?

c) Decide with reasons which phenomenon would be better to be used as measuring sensor?

d) Predict the phenomenon value if the measured temperature are 70 then 90?

Least Square equations

$$y = mx + b$$

$$m = \frac{N \cdot \sum xy - \sum x \cdot \sum y}{N \cdot \sum x^2 - \sum x^2} \qquad b = \frac{\sum y - m \cdot \sum x}{N}.$$

Correclation Coeffiecient Equation

$$r = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\left(\sum x^2 - \frac{(\sum x)^2}{n}\right)\left(\sum y^2 - \frac{(\sum y)^2}{n}\right)}}$$