



Examination Answer Books

Instructions to Candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

SURNAME: Denning

FORENAME(S): CHRISTOPHER JAMES

1	Student Number	P151597
2	Title of Examination Paper	Transducers & Signal conditioning
3	Module Code	ACDA5006
4	Date and Time of Examination	15/05/19 12:00PM
5	Examination Venue	1A 307
6	Seat Number	
7	Number of Answer Books handed in	1

[illegible]

(Gweler yr ochr arall am y fersiwn Cymraeg)

63%

26.5

637

261



Q 1 accuracy: How close the measurement is to the mark.

DO YOU MEAN ACTUAL VALUE?

precision: How clustered/frequent the ~~next~~ measurements are all together.

~~precise~~

Q2.A



look to graph paper.

3%

3.9

~~2.A~~

2.B

$$\text{Sensitivity} = \frac{\overset{\text{Deflection}}{(140 - 0) \text{ y}}}{\underset{\text{Load}}{(100 - 0) \text{ x}}} \quad \text{Starling's example}$$

▷ sensitivity for 21°C

$$\frac{\Delta y}{\Delta x} = \frac{4.0}{100 - 0} = 0.04 \text{ mm/kg}$$

▷ sensitivity for 35°C

~~0.2 = 4~~ ~~4.6~~

$$\frac{\Delta y}{\Delta x} = \frac{4.6 - 0.2}{100 - 0} = \frac{4.4}{100}$$

$$= 0.044 \text{ mm/kg}$$

Q 2c

Zero drift

~~first~~

first... "Zero offset"

~~Deflection of 21°C~~

$$\text{Zero offset} = 0.2 - 0.0 = \underline{\underline{0.2}} \text{ (200 } \mu\text{m)}$$

th.

... difference in temperature

$$\Delta T = 35 - 21 = \underline{\underline{14}}$$

~~Zero drift~~

$$\text{Zero drift} = \frac{\text{Zero offset}}{\text{Temperature difference}}$$

$$= 0.2 / 14 = \underline{\underline{0.0143}} \mu\text{m}/^\circ\text{C}$$



Q2C	Sensitivity drift
-----	-------------------

... difference in sensitivity

35 21

Sensitivity of ~~35~~°C, Subtract sensitivity of ~~35~~°C

$$\Delta \text{Sens} = \frac{0.04}{0.04} - \frac{0.04}{0.04} = 0.356$$

$$\frac{0.04}{0.04} (0.044 - 0.04) = 4 \times 10^{-3} (4 \text{ nm})$$

$$\text{Sensitivity drift} = \frac{\Delta \text{ Sens}}{\Delta \text{ Temp}}$$
$$= \frac{4 \times 10^{-3}}{14}$$

$$\text{Ans} = 0.000286 \quad (0.286 \times 10^{-3})$$

micro
~~metres~~ metres?
units

SHOULD BE $\text{mm/kg/}^\circ\text{C}$

$$Q_2 = q$$

Q3A measurement precision is achieved by...

The addition of all ~~values~~ measurements / the number of measurements

$$= \frac{42.93}{10}$$

42.93

Ans = 4.293 metres

$\pm 0.003m$

Q3B

The maximum ^{inaccurate} ~~precision~~ measurement is 4.296 (^{0.02} ~~0.003~~) metres

$$4.296 - 4.276 = (0.02+) \text{ metres}$$

Q3C

with the increase in ^{temperature, to} ~~temperature~~ ^{by} 30°C the new maximum inaccurate measurement is 4.430 metres

$$4.430 - 4.276 = (0.154+) \text{ metres}$$

Q3D ← unable to



Q4 The difference between random errors and systematic errors...

Random errors; external errors to the device or system
e.g; damaged by user,

systematic errors; internal errors of the device or system
e.g; short circuitry; over Heating

2x

2.5

Q5a) Graph on separate sheet - (4)

Non-linearity

9

Q5B

$$\frac{\text{Non-linearity}}{\text{Full scale deflection}} \times 100 = \text{Ans}$$

full scale deflection

$$\frac{0.8}{14} = (0.0571) 100 = 5.72\%$$

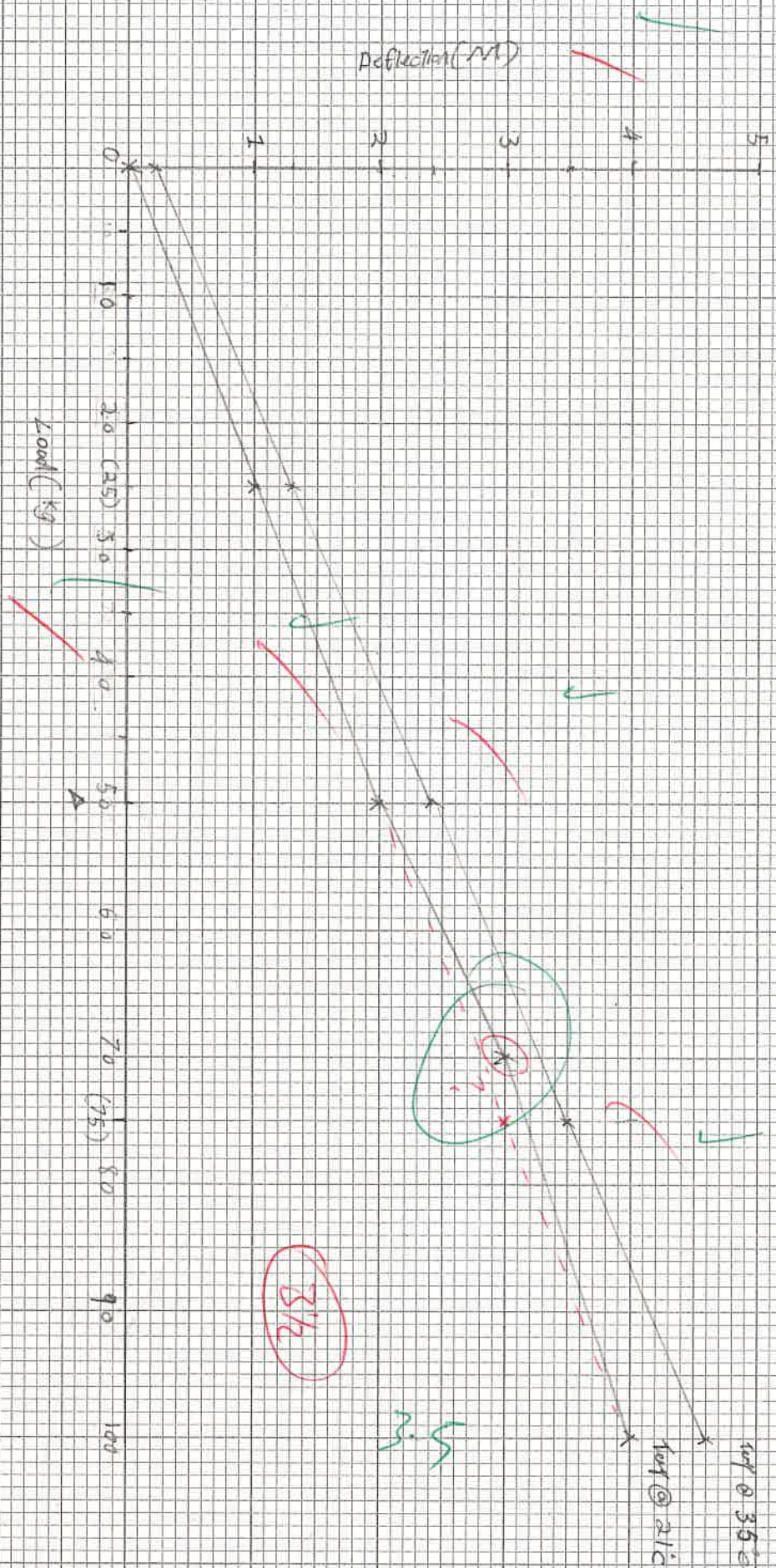
2

2

Q5c) → unable,

Q 2. A

P151597



Q5 A/R

P151597

