higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PROCESS CONTROL
NQF LEVEL 4

(6050414)

4 December 2020 (X-paper)
09:00–12:00

This question paper consists of 6 pages.

315Q1N2004

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TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Start each section on a new page.
5. Write neatly and legibly.

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SECTION A

QUESTION 1

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1–1.5) in the ANSWER BOOK.

1.1 Sequence of actions or set of operations and events where resources are used to produce a particular end product:

A Statistical process control
B Industrial processes
C Standards
D Specifications

1.2 A capability study is …

A the true calculation of the average and standard which requires measuring lots of samples.
B the location of the curve.
C a bar graph that shows how frequently data falls within specific cells.
D none of the above.

1.3 The lower control limit of an R-chart is mostly set at zero because it …

A defines how often a measured value gets close to a target value.
B monitors the process.
C is drawn in the same way as the moving x-chart.
D is not statistically possible to get a negative range in a process.

1.4 A slave loop is also called a …

A control loop.
B secondary loop.
C master loop.
D multiple loop.

1.5 Why are PLC programs favoured?

A They can be quickly and easily changed to accommodate new conditions without any cost.
B They contain equipment that operates discontinuously.
C They can be used for added safety.
D They are controlled variables.

(5 × 2) **[10]**

QUESTION 2

Complete the following sentences by writing only the missing word or words next to the question number (2.1–2.5) in the ANSWER BOOK.

2.1 A … is the desired value of a variable.

2.2 Diagrams that resemble the real-life appearance of process equipment are known as …

2.3 A … is a line found in the middle of a control chart.

2.4 Deviations caused by a system breakdown are known as …

2.5 Before any … procedure, systematic checks should be made to ensure that the equipment is ready.

(5 × 1) **[5]**

QUESTION 3

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (3.1–3.5) in the ANSWER BOOK.

3.1 Attribute data is collected from the production processes.

3.2 A jump is indicated by points falling around the centreline which suddenly drop or rise.

3.3 A controller allows an operator to establish or change a set point.

3.4 Plant shut-down is the major activity in process plants.

3.5 The wild stream is measured and multiplied by a constant which is the desired ratio.

(5 × 1) **[5]**

TOTAL SECTION A: 20

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SECTION B

QUESTION 4

4.1 Differentiate between *aesthetic* and f*unctional* properties of a product. (4)

4.2 Draw a process flow diagram indicating how to perform statistical process control. (9)

4.3 Define *data collection*. (2)

4.4 Name FIVE factors to consider when analysing the properties of a substance. (5)

4.5 Indirect sensing measures the property of a material in order to determine its level.

List FIVE instruments for measuring the level of a liquid. (5)
[25]

QUESTION 5

5.1 Write down each of the following acronyms in full:

5.1.1 DCS

5.1.2 RTU

5.1.3 PLC

5.1.4 SCADA

5.1.5 HMI

(5 × 1) (5)

5.2 Define *error*. (2)

5.3 Name SIX types of parameters that can be set or changed by operational control. (6)

5.4 Draw each of the following PFD symbols:

5.4.1 Conveyor

5.4.2 Dryer

5.4.3 Covered tank

(3 × 3) (9)

5.5 Write brief notes on demand-side level control. (9)

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5.6 Describe FOUR possible causes of deviations indicated by a cycle. (4)

5.7 Explain *normal operating conditions*. (2)

5.8 Describe the main responsibility of a process controller. (2)

5.9 What does LSS stand for? (1)
[40]

QUESTION 6

6.1 When do alarm sound in processing plants? (2)

6.2 Draw an example of a logic controller setup. (6)

6.3 Explain why feedback control is insufficient for processes with large dead time. (4)

6.4 List THREE groups of advanced controls. (3)
[15]

TOTAL SECTION B: 80
GRAND TOTAL: 100

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