higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PROCESS CONTROL
NQF LEVEL 3

(6050403)

20 November 2018 (X-Paper)
09:00–12:00

This question paper consists of 5 pages.

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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. Write neatly and legibly.

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QUESTION 1

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (1.1.1–1.1.10) in the ANSWER BOOK.

1.1 A thermometer is an example of an analogue instrument.

1.2 Manual recording involves capturing measurements on a computer.

1.3 One of the advantages of the SI unit is that no conversions are necessary because there is one unit for each quantity.

1.4 A barometer is an instrument used to measure atmospheric pressure.

1.5 A differential u-tube has one closed leg.

1.6 Sight glasses can be used for highly viscous liquids.

1.7 A float type gauge produces reliable results when used for clean liquids.

1.8 An indicator is a manually readable device that displays the process information sent to it by the transmitter.

1.9 Digital video recorders record and store video camera output in digital form on the disc.

1.10 Chart recorders and strip charts are data acquisition tools that generate a plot, graph or other visualisation of data versus time.

(10 × 1) **[10]**

QUESTION 2

Complete the following sentences by using the words provided in the list below. Write only the word(s) next to the question number (2.1.1–2.1.5) in the ANSWER BOOK.

local display; remote; humidity; concentration; actuator

2.1 … is an instrument that takes measurements that is not in close proximity to the materials or products it measures.

2.2 The … is a mechanical device for moving or controlling a mechanism or system.

2.3 … is in the vicinity of, or in close proximity to, the object being measured.

2.4 … is the moisture in the air.

2.5 … is the amount of a substance in a specific volume of liquid.

(5 × 1) **[5]**

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QUESTION 3

Indicate whether the instrument listed below is a direct or an indirect flow meter.

3.1 Weir

3.2 Oval gear meter

3.3 Differential flow meter

3.4 Rotameter

3.5 Nutating disc

(5 × 1) **[5]**

QUESTION 4

4.1 Explain the working principles of a rotameter. (10)

4.2 Explain the function of interlocks in process control. (2)

4.3 An evaporator transforms a substance from a liquid form into a gaseous form.

Name THREE uses of the evaporation transformation process. (3 × 1) (3)

4.4 Define *saturated steam*. (2)

4.5 Describe a feed-forward control system. (2)

4.6 Define *distillation*. (3)

4.7 A fired furnace is used in hydrocarbon and chemical processing units.

Name FIVE such industries. (1 × 5) (5)

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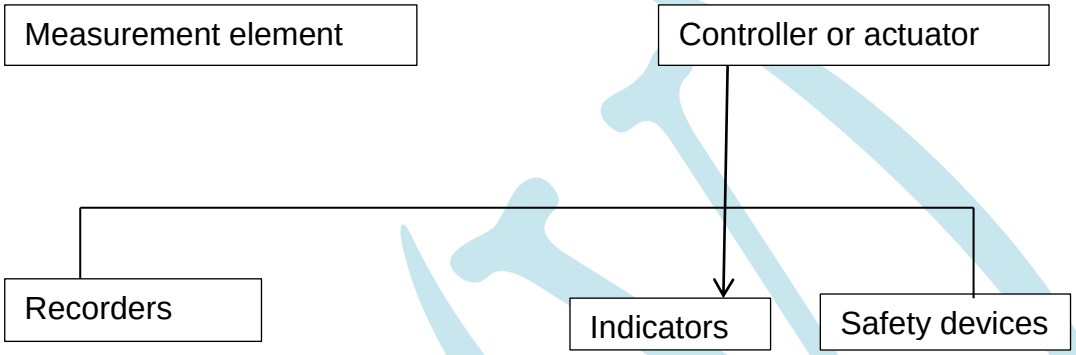
QUESTION 5

5.1 Explain, with the aid of a diagram, the working principles of a steam heater. (14)

5.2 The following diagram shows a typical integration of the elements of a control system.

Explain the interconnections and joint functionality of the system.



(10)
[24]

QUESTION 6

6.1 Name THREE signal transfer methods and explain each. (3 × 3) (9)

6.2 State the purpose of a thermostat. (2)

6.3 Briefly explain the importance of the FOUR safety devices found in the process plant. (2 × 4) (8)

6.4 What is the difference between digital instruments and analogue instruments? (4)

6.5 What is the difference between local display and remote display? (4)

6.6 Why is it that the smaller the piston diameter in a gauge tester, the higher the pressure created in the system? (2)

[29]

TOTAL: 100

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