



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

**PROCESS CONTROL
NQF LEVEL 4**

19 November 2024

This marking guideline consists of 6 pages.

SECTION A**QUESTION 1**

- 1.1 B
- 1.2 B
- 1.3 C
- 1.4 B
- 1.5 D

(5 × 1) [5]

QUESTION 2

- 2.1 Decision making
- 2.2 Set point
- 2.3 Pictorial
- 2.4 Cascade control
- 2.5 Control valve

(5 × 1) [5]

QUESTION 3

- 3.1 False
- 3.2 True
- 3.3 True
- 3.4 False
- 3.5 True

(5 × 1) [5]

TOTAL SECTION A: 15

SECTION B**QUESTION 4**

- 4.1
- Products must meet standards specified by law.
 - Products must meet standards set by various international bodies.
 - Products must meet standards set by the South African Bureau of Standards (SABS).
 - Products must meet market requirements or standards set by consumers. (4)
- 4.2 X-charts monitor the quantitative✓ characteristics of processes,✓ while R-charts represent the range of the variables✓ to be measured.✓ (2 + 2) (4)
- 4.3 Corrective action is the part of the process control chain where deviations are corrected. (2)
- 4.4
- Description of the type of nonconformity
 - Action taken to deal with the nonconformity
 - Date of dealing with the nonconformity
 - Particulars of possible concessions (4)
- 4.5
- A sensor can be connected to a process pipe.
 - An analyser can be designed to form part of the equipment with the process fluid to be analysed flowing into it. (2)
- 4.6
- Displacers
 - Capacitive probes
 - Bubblers
 - Resistive tapes
 - Weight measurements (5)
- 4.7
- $$A = \pi r^2$$
- $$= 3,14 \times (12 \text{ m})^2$$
- $$= 452,39 \text{ m}^2$$
- $$r = d/2 = 24 \text{ m}/2 = 12 \text{ m}✓$$
-
- $$Q = VA✓$$
- $$= 3,5 \text{ m/s} \times 452,39 \text{ m}^2✓$$
- $$= 1\,583,36 \text{ m}^3/\text{s}✓$$

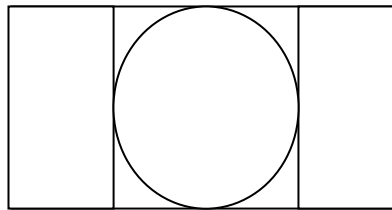
(4)
[25]

QUESTION 5

- 5.1 • Information flow
 • Decision making (2)
- 5.2 During plant start-up, pipes are empty, temperatures are low and valves are in the wrong position.✓ Control problems always arise because all the process measurements are below the set point,✓ which may in turn lead to health hazards if not handled properly.✓ (3)
- 5.3 5.3.1 • Manual control
 • Automatic control
 • Cascade control (Any TWO) (2)
- 5.3.2 Manual control is used to start-up a plant✓ and once the plant starts running, it is switched to automatic control.✓ (2)
- 5.3.3 • Overrides or selective controls
 • Interlocks
 • Other advanced control methods (Any TWO) (2)
- 5.4 A controller receives a process signal or process measurement✓ from the transmitter,✓ while a control interface is the interface that an operator use✓ to give instructions to the process.✓ (2 + 2) (4)
- 5.5 • Programmable controllers
 • Stand-alone controllers
 • Hydraulic controllers
 • Batch-process controllers (4)
- 5.6 A control bus manages information flow between different components✓ by ensuring that operations occur at the same time.✓ (2)
- [21]**

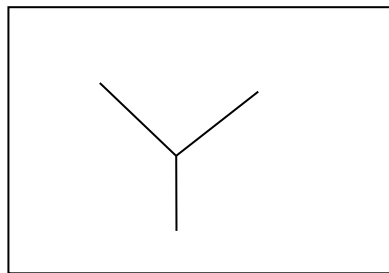
QUESTION 6

6.1 6.1.1



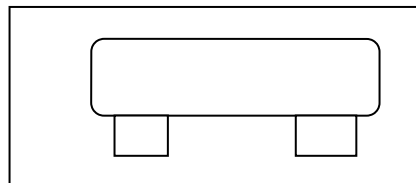
✓✓✓

6.1.2



✓✓✓

6.1.3

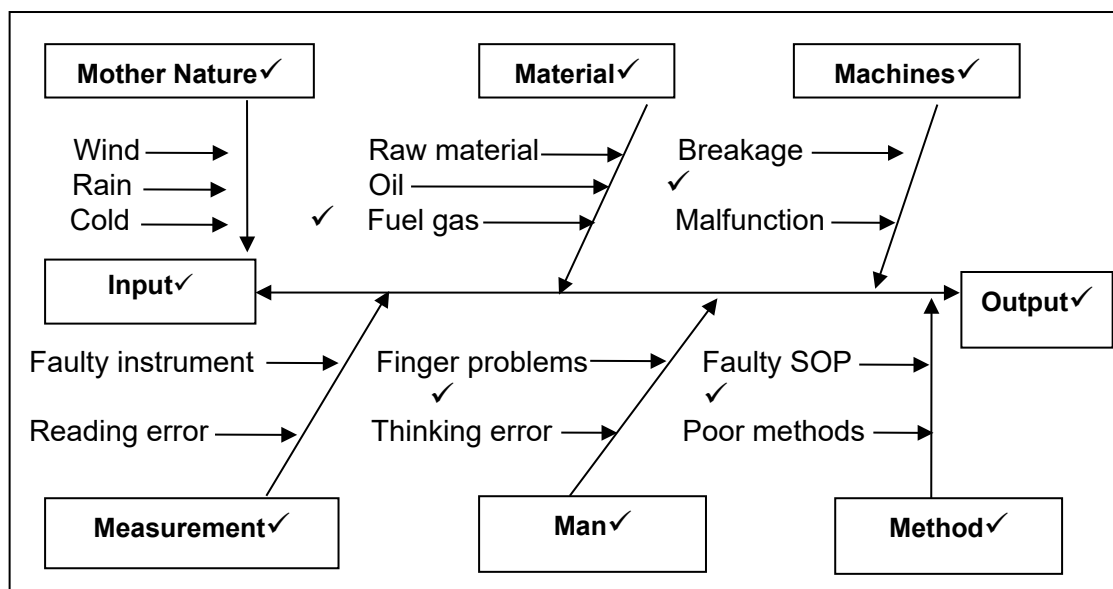


✓✓✓

(3 × 3) (9)

6.2

Cause-and-effect diagram

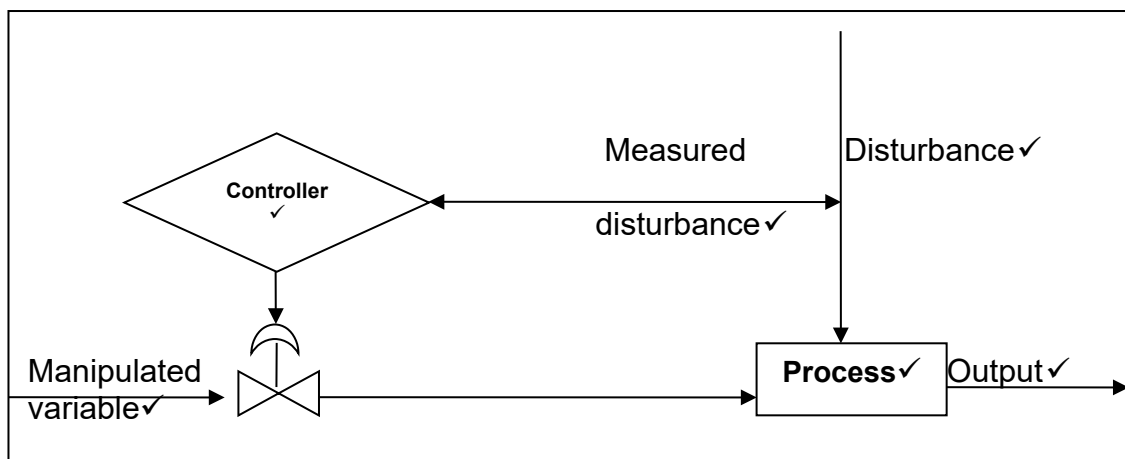


(5 for the main causes + 5 for any cause and effect of the problem) (10)

- 6.3
- Symptoms that are observed either physically or when being out in the plant
 - Different possible causes that may give rise to the described problems
 - Different solutions available to address these causes
- (3)
- 6.4 A process controller should communicate all changes to other personnel✓ and make notes of the alterations or modifications made.✓ (2)
- [24]**

QUESTION 7

- 7.1 7.1.1
- Single action
 - Repetition action
 - Once off applications with complex manipulations
- (3)
- 7.1.2
- Control room
 - Plant floor
- (2)
- 7.2
- Adders
 - Multipliers
 - Low limiters
 - High limiters
- (4)
- 7.3



(6)
[15]

TOTAL SECTION B: 85
GRAND TOTAL: 100