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.

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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 $A = \pi r^2$
$= 3{,}14 \times (12\ m)^2$
$= 452{,}39\ m^2$
$r = d/2 = 24\ m/2 = 12\ m$✓

$Q = VA$✓
$= 3{,}5\ m/s \times 452{,}39\ m^2$✓
$= 1\ 583{,}36\ m^3/s$✓ (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)

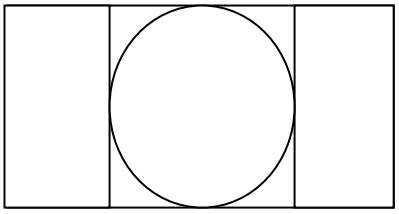
5.5
- Programmable controllers
- Stand-alone controllers
- Hydraulic controllers
- Batch-process controllers (4)

5.6 A control bus manages information flow between different components✓ by ensuring that operations occur at the same time.✓ (2)

[21]

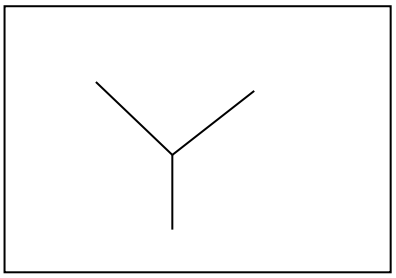
QUESTION 6

6.1 6.1.1



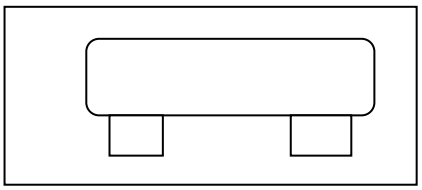
✓✓✓

6.1.2



✓✓✓

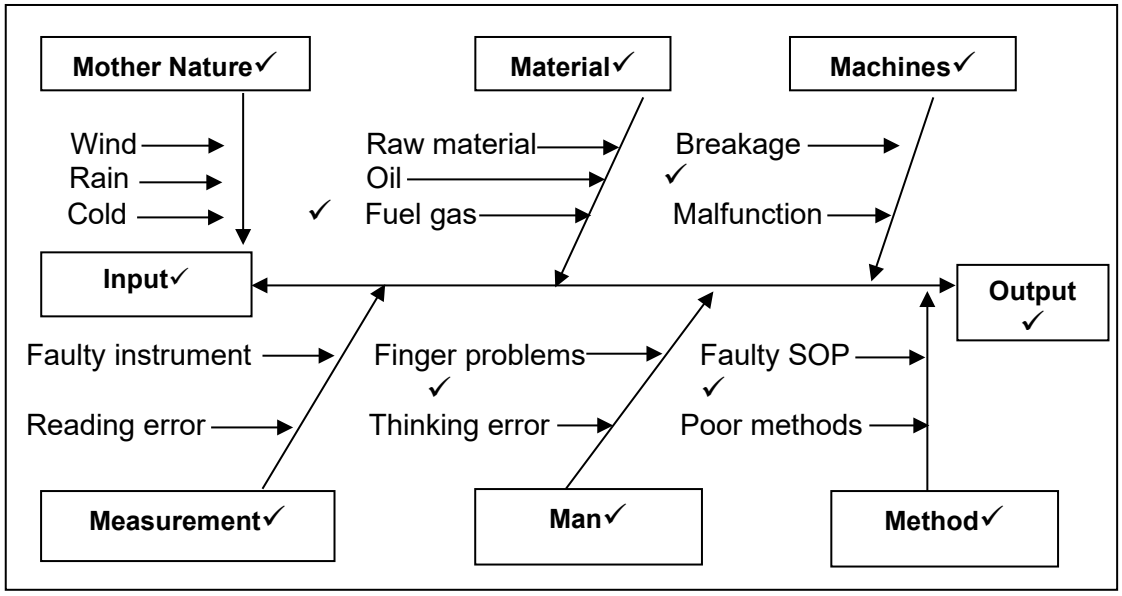
6.1.3



✓✓✓

(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]

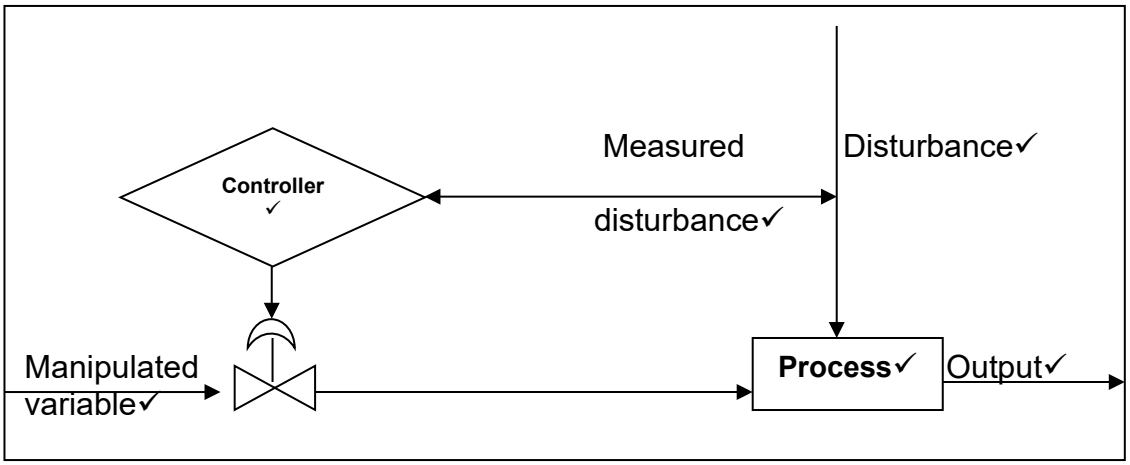
QUESTION 7

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

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