higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PROCESS CONTROL
NQF LEVEL 4

(6050414)

15 March 2018 (Y-Paper)
13:00–16:00

This question paper consists of 6 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. Start each question on a NEW page.
5. 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 (1.1–1.5) in the ANSWER BOOK.

1.1 SPC stands for standard procedure consequences.

1.2 A bell-shaped distribution curve is formed on a chart when normal deviations occur.

1.3 A control chart predicts when a process is in control or out of control.

1.4 Piezoelectricity is the charge that accumulates in some liquid particles after an applied mechanical stress.

1.5 One of the requirements needed for plant start-up procedures is a process flow sheet.

(5 × 1) **[5]**

QUESTION 2

Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–I) next to the question number (2.1–2.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
2.1	Seven data points in a row making a shift upwards or downwards	A	carbon dioxide
2.2	The Act that ensures human health and safety within any environment	B	control logic system
2.3	A gas that contributes to the greenhouse effect globally	C	COIDA
2.4	A repeating program that provides an output in order to reach the desired input	D	jump
2.5	Control used in chemical processes	E	ratio control
		F	OHS
		G	control loop
		H	split-range control
		I	trends

(5 × 1) **[5]**

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QUESTION 3

3.1 Name THREE types of deviations. (3)

3.2 A process with a series of operations can be influenced by different factors which can cause deviations.

Name and describe THREE of these factors. (6)

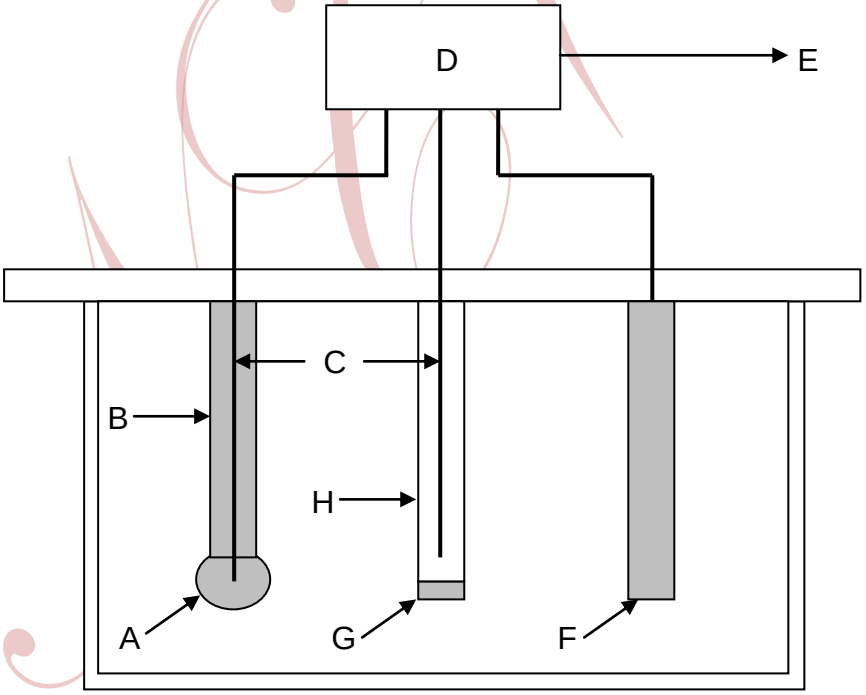
3.3 Name THREE things that can happen if data is not properly collected. (3)

3.4 ISO 9001:2000 has set standard procedures to dispose of non-conforming products.

State the THREE procedures carried out when disposing non-conforming products. (3)

3.5 The diagram below shows a pH sensor.

Label the parts indicated by writing only the answer next to the letter (A–H) in the ANSWER BOOK.



(8)
[23]

QUESTION 4

4.1 Name the FIVE functions that are performed by DCS in industry. (5)

4.2 Explain why measurements obtained from sensors cannot be directly used for control. (2)

4.3 Differentiate between pictorials and PFD as used in DCS screen schematics. (4)

4.4 Draw a diagram indicating a boiler THREE-element level control. (6)

4.5 Control charts describe the performance of a process.

Explain when the process is:

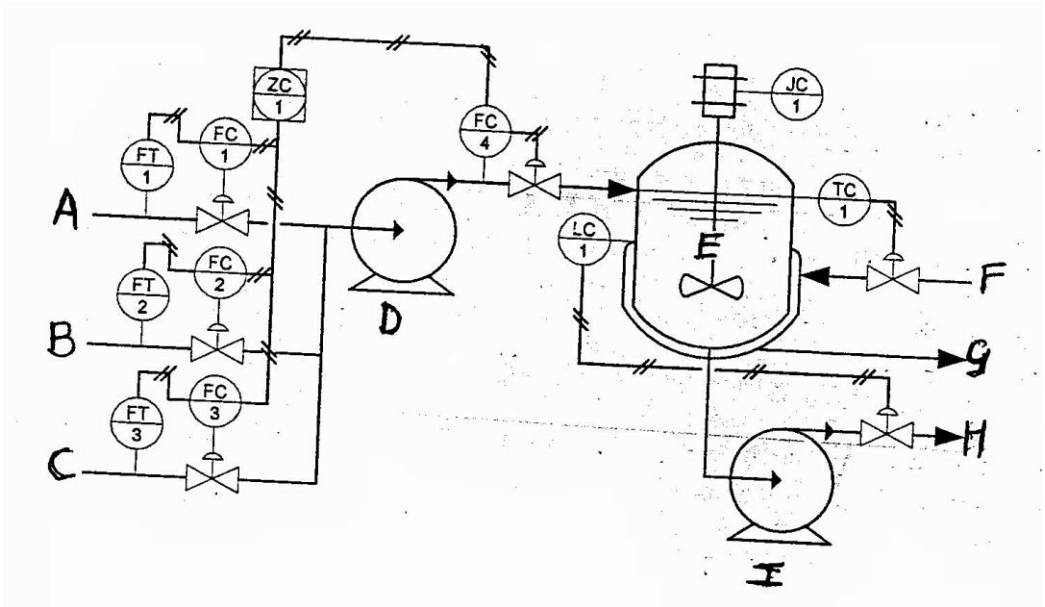
4.5.1 In control

4.5.2 Out of control

(2 × 3) (6)
[23]

QUESTION 5

5.1 Study the flow diagram of the blending process and answer the questions.



5.1.1 Name the components (A–I). (9)

5.1.2 Explain the control logic of each loop. (11)

5.2 State SIX reasons for shutting down a plant. (6)
[26]

QUESTION 6

6.1 In process plants, abnormal conditions can be detected by the operator or by the control system.

6.1.1 Name the THREE types of automatic control systems. (3)

6.1.2 State TWO functions of automatic control systems. (4)

6.2 What makes PLCs to be more reliable and durable in the industrial environment? (2)

6.3 Show with the aid of a diagram, how a closed-loop process with a feedback controller functions. (9)

[18]

TOTAL: 100

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