higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

STORED PROGRAMME SYSTEMS
NQF LEVEL 4

(10040154)

7 November 2022 (X-paper)
09:00–12:00

This question paper consists of 4 pages.

131Q1N2207

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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. Drawings should be neat and labelled.
5. Symbols should be drawn to the IEC standards.
6. All terminal numbering should be shown.
7. All labelling should be shown.
8. Use only a black or blue pen.
9. Write neatly and legibly.

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QUESTION 1

1.1 Explain the meaning of *telemetry systems* in an automated communication industry. (2)

1.2 List FOUR components that make up a telemetry system. (4)

1.3 Draw a labelled block diagram of a telemetry system to apply a communication system in an automated industry. (10)

1.4 Telemetry systems are classified as radio frequency telemetry that are used to modulate a carrier signal compatible with the given transmission medium.

List FOUR types of modulation used in a telemetry system. (4)

[20]

QUESTION 2

2.1 *Fieldbus* is a generic term for a number of digital industrial networks. Fieldbuses are used to link field devices to be controlled and monitored in automated enterprise systems.

Describe FIVE advantages of fieldbus technology in hybrid manufacturing systems. (5 × 2) (10)

2.2 Explain the most significant design rule for Ethernet communication. (3)

2.3 List SEVEN possible causes of problematic Ethernet network connectivity. (7)

[20]

QUESTION 3

3.1 What is a *human-machine interface* (HMI)? (1)

3.2 Draw an HMI block diagram that will show how to use a PLC to coordinate the operation of multiple machines in an assembly process. (4)

3.3 An HMI is used for THREE primary functions in an automatic application, namely as a pushbutton replacer, data handler, and overseer.

Explain each of the above-mentioned primary functions of an HMI. (3 × 2) (6)

3.4 The operating environment should always be considered when selecting an HMI.

Explain THREE operating environments that must be considered when selecting an HMI. (3 × 2) (6)

3.5 Give THREE technological advantages that HMI offers to an automated application. (3)

[20]

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QUESTION 4

4.1 Differentiate between a *pictorial diagram* and a *sequence diagram*. (2)

4.2 Draw a schematic diagram to show how a 3-phase motor control circuit and a low-voltage light circuit are hard-wired together in a motor control application. (10)

4.3 Explain what is meant by *electromagnetic interference (EMI)*. (2)

4.4 Explain the purpose of using a wiring colour code in technical documentation. (2)

4.5 Name the wiring colour code used for the following wiring:

4.5.1 Supplies (AC/DC)

4.5.2 Returns (neutral and negative DC)

4.5.3 AC outputs

4.5.4 DC outputs

(4 × 1) (4)

[20]

QUESTION 5

5.1 Describe the TWO purposes for grounding electrical equipment. (2 × 2) (4)

5.2 Draw up a checklist that you would use to set up a multi-meter when testing an outlet for proper grounding. (5)

5.3 *Periodic maintenance* refers to activities performed on equipment based on a set time interval. The purpose of periodic maintenance, or time-based maintenance, is to maintain smooth operation of a machine or other application/asset.

Illustrate by means of a block diagram how a periodic maintenance workflow of an application/asset can be performed. (8)

5.4 The effectiveness of the maintenance work that has been carried out should be reviewed regularly to improve the previous decisions so that subsequent maintenance expenditure will be more effective.

Identify THREE issues to consider when reviewing the maintenance work. (3)

[20]

TOTAL: 100

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