higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

STORED PROGRAMME SYSTEMS
NQF LEVEL 4

(10040154)

12 November 2024 (X-paper)
09:00–12:00

This question paper consists of 5 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
STORED PROGRAMME SYSTEMS
NQF LEVEL 4
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 drawn neatly 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 All communication systems start with data acquisition and are interfaced using various protocols transmitted using different transmission media.

What is the main difference between *synchronous transmission* and *asynchronous transmission*? (2 × 1) (2)

1.2 Name ONE common example of asynchronous communication that is used in a workplace. (1)

1.3 What is the best transmission medium to carry data in a computer network that is exposed to electric interferences? (1)

1.4 List THREE common digital modulation techniques. (3 × 1) (3)

1.5 Define the term, *transducer*. (2)

1.6 Draw the interfacing signal flow block diagram represented by the following statement:

The measured quantity is measured by sensors and then fed into the interface system via an electrical isolation process where it is amplified and then sent to the A/D converter for processing. The processed control signal is then converted by means of a D/A converter, amplified and then sent to the actuator via an electrical isolation process. (11 × 1) (11)

[20]

QUESTION 2

2.1 Explain the following production processes that are used by industry to arrange and connect field bus components:

2.1.1 Distribution process

2.1.2 Material handling

2.1.3 Palletising process

2.1.4 Testing process

2.1.5 Buffering

(5 × 2) (10)

2.2 What are the advantages of *Industrial Ethernet* over *Traditional Ethernet*? (4 × 1) (4)

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2.3 When installing an Industrial Ethernet fieldbus for quality planning, one has to ensure that adequate documentation of all installation procedures is in place. These can then be referred to during operations and modifications.

Draw up the checklist that will contain the inventory list for the above statement. (6 × 1) (6)

[20]

QUESTION 3

3.1 List any THREE possible safety factors to consider when designing and installing a new mechatronic system. (3)

3.2 Draw a schematic diagram to show how electromechanical devices can be used to provide basic protection for a machine not to start when the guard is open. (7 × 1) (7)

3.3 Explain the purpose of dead fronts. (4 × 1) (4)

3.4 Explain THREE components that the Safety Instrumented System (SIS) is made up of. (3 × 2) (6)

[20]

QUESTION 4

4.1 List FIVE characteristics that a machine designer needs to consider when selecting the right motor for automated manufacturing systems. (5)

4.2 Name and explain the THREE most common characteristics that are shared by mechatronic systems. (3 × 2) (6)

4.3 What is a timing diagram? (1)

4.4 Draw a timing diagram representation of a sequence of events by using a timing chart in which conditions and events are graphed in a time relationship to one another. (8 × 1) (8)

[20]

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QUESTION 5

5.1 Describe the following commissioning steps that govern the commissioning procedures of a mechatronic systems:

5.1.1 Visual inspection

5.1.2 Mechanical installation

5.1.3 Electrical installation

(3 × 2) (6)

5.2 Draw up a checklist of wiring guidelines that provides general information on how to wire most automation equipment. (10 × 1) (10)

5.3 In order to determine the reliability and the security of a system, different reliability parameters are used.

List FOUR reliability parameters used for systems that should not be refurbished in the future. (4)

[20]

TOTAL: 100

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