higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ENGINEERING PRACTICE AND MAINTENANCE
NQF LEVEL 3

(6021003)

6 March 2020 (X-paper)
09:00–12:00

This question paper consists of 7 pages.

277Q1S2006

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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: TECHNOLOGICAL SOLUTIONS IN ENGINEERING

1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1.1–1.1.8) in the ANSWER BOOK.

1.1.1 With life cycle design, engineers focus on … of the design process.

A a few aspects
B specific aspects
C all aspects
D the quality



1.1.2 … means making a few small adjustments to the design.

A Modification
B Upgrading
C Voltmeter
D File

1.1.3 Engineers using the quality approach for designs focus on making sure that a product is of the highest …

A performance.
B efficiency.
C price.
D quality.



1.1.4 Technological solutions include the different ways that … is used to make people's lives easier.

A knowledge
B fruits
C technology
D water

1.1.5 … help engineers to develop ideas into approximations or representations of real products, processes or systems.

A Prototypes
B Models
C Pictures
D Pilot studies

1.1.6 The first stage in the design process is ….

A needs assessment.
B problem formulation.
C abstraction and synthesis.
D implementation.



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1.1.7 A small working model of the design solution is called a …

A prototype.
B model.
C picture.
D pilot study.

1.1.8 … help people find a design solution by seeing how it works.

A Prototypes
B Models
C Pictures
D Pilot studies

(8 × 1) (8)

1.2 Differentiate between the following:

1.2.1 Design for quality and life cycle design

1.2.2 Prototype and model

1.2.3 Sodium grease and aluminium grease

(3 × 2) (6)

1.3 State SIX skills that engineers should have to research solutions to problems. (6)

[20]

QUESTION 2: FAULT FINDING TECHNIQUES

2.1 Direct observation techniques include directly looking and listening for faults.

Name FOUR questions that may be asked when using each of the following observation techniques to design a check list:

2.1.1 Visual fault-finding technique

2.1.2 Auditory fault-finding technique

(2 × 4) (8)

2.2 Differentiate between the following:

2.2.1 A failure in a system and a fault in a system

2.2.2 Setting up a system to fail and simulations

(2 × 2) (4)

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2.3 Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–H) next to the question number (2.3.1–2.3.8) in the ANSWER BOOK.

COLUMN A		COLUMN B	
2.3.1	Directly looking and listening for faults	A	fault
2.3.2	This test makes sure that there is no leakage of electricity in a system	B	failure
2.3.3	When a part in a product has broken down	C	direct observation
2.3.4	Tests carried out to make sure that different components work properly together	D	set up a system to fail
2.3.5	You can see which parts are effected and which parts are not affected	E	operational testing
2.3.6	When a product does not perform as expected	F	simulations
2.3.7	You need to use special instruments	G	measurement-based testing
2.3.8	Can be carried out on a computer	H	short circuit test

(8 × 1) (8)

[20]

QUESTION 3: DIAGNOSIS OF MECHANICAL AND ELECTRICAL FAULTS

3.1 A customer calls you to repair his faulty electric weed eater.

State FOUR rules you will follow to investigate the cause of the fault. (4)

3.2 With a systematic search method certain steps are followed in an organised process to search for and locate faults.

State the first FOUR steps to be followed in a systematic search method. (4)

3.3 Draw a table indicating FOUR differences between a *systematic search method* and a *random search method*. (4 × 2) (8)

3.4 As an engineering plant technician, you have repaired a faulty gear drive system.

Prepare a fault-finding diagnostic report for management indicating FOUR important points that should be included in the report. (4)

[20]

QUESTION 4: LUBRICANTS AND LUBRICATION SYSTEMS

4.1 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (4.1.1–4.1.8) in the ANSWER BOOK

4.1.1 A lubricant is any substance that is used to provide a coating or film between moving metal parts.

4.1.2 When selecting a lubricant, correct viscosity is the most important thing to consider.

4.1.3 Natural lubricants are made from artificial ingredients.

4.1.4 Liquid lubricants are used for many different applications where fluids are needed to transmit power, to lubricate machine parts and to prevent wear and corrosion.

4.1.5 The flash point is the highest temperature at which a gas above a liquid will ignite when a flame is applied to it.

4.1.6 Viscosity is the degree to which a substance, like a lubricant is sticky and thick so that it cannot flow easily.

4.1.7 Adhesion is the stickiness between two surfaces which is caused by pressure rather than heat.

4.1.8 Detergents are additives to lubricants that keep the components in a system dirty.

(8 × 1) (8)

4.2 Different types of lubrication systems are used in industry.

Describe the following lubrication systems:

4.2.1 Force-feed

4.2.2 Dry sump

4.2.3 Manuel feed

(3 × 2) (6)

4.3 Leaks can be a major source of wasted energy in a system. They can also lead to other operating losses.

State TWO of these operating losses. (2)

4.4 Define the following terms:

4.4.1 Hydrostatic principle

4.4.2 Hydrodynamic principle

(2 × 2) (4)

[20]

QUESTION 5: PLANT MAINTENANCE

5.1 State FOUR safe working practices to be observed when conducting a task. (4)

5.2 State FOUR important points that should be included in workplace maintenance records. (4)

5.3 Differentiate between an *extraction plant* and a *power plant*. (2 × 2) (4)

5.4 Choose the correct option from those given in brackets. Write only the answer next to the question number (5.4.1–5.4.8) in the ANSWER BOOK.

5.4.1 An engineering (plant/equipment) is a factory or building in which industrial process take place, such as manufacturing goods.

5.4.2 A power plant is a (processing/manufacturing) plant.

5.4.3 Water purification is a process of (removing/adding) contaminants or pollutants and poisons from a raw water source.

5.4.4 One example of a power tool is (pliers/a drill).

5.4.5 (Conveyers/Lifts) are used to transfer crushed stone in a gold production plant.

5.4.6 Fire protection rules ensure that there is no risk of (gas/fire).

5.4.7 Identify potential (hazards/actions) so that you can stop accidents before they happen by doing something about these dangers.

5.4.8 Avoid operating machines in certain (dangerous/safe) conditions.

(8 × 1) (8)

[20]

TOTAL: 100

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