higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

PROFESSIONAL ENGINEERING PRACTICE
NQF LEVEL 4

(6021014)

1 March 2018 (Y-Paper)
13:00–16:00

This question paper consists of 8 pages.

NCV

Copyright reserved

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. ALL sketches must be neat, clear and in proportion.
5. ALL work you do NOT want to be marked must be clearly crossed out.
6. Start each question on a NEW page.
7. Write neatly and legibly.

NCV

Copyright reserved

QUESTION 1

1.1 Define the term *water pollution*. (1)

1.2 Give THREE causes of water pollution. (3)

1.3 Explain the difference between *point source pollution* and *nonpoint source pollution* as related to water pollution. (2)

1.4 Waste water is contaminated water that has been used in industries and has to be cleaned before it can be released back into the environment.

Briefly explain the following methods used to clean waste water:

1.4.1 Filtering of water

1.4.2 Sedimentation

1.4.3 Disinfection

(3 × 2) (6)

1.5 Indicate whether the following statements are TRUE or FALSE. Write only 'true' or 'false' next to the question number (1.5.1–1.5.5) in the ANSWER BOOK.

1.5.1 Friendliness is a good example of a positive attitude towards others in the workplace.

1.5.2 Integrity requires employees to carry out their duties in a responsible manner.

1.5.3 Absenteeism from work does not have a negative effect on the levels of production in the workplace.

1.5.4 Sexual harassment in the workplace affects women only.

1.5.5 Incompetence is a good example of a negative working attitude in the workplace.

(5 × 1) (5)

1.6 Explain the term *transportation congestion*. (2)

1.7 Discuss the negative consequences transportation congestion has on road users and the environment. (5)

1.8 What does the acronym SAID stand for? (1)

[25]

Copyright reserved

QUESTION 2

2.1 During the design process, the design team has to select the best possible design solution from a number of possible design solutions. For this purpose, a concept selection matrix is used.

Analyse the concept selection matrix given below and answer the questions.

	Weighting factor	Concept 1		Concept 2		Concept 3	
Cost	(2.1.3)	5	30	4	24	5	30
Safety	9	8	72	6	54	(2.1.4)	63
Maintenance	7	8	56	9	63	3	21
Reliability	8	6	48	2	(2.1.5)	6	48
Simplicity	4	4	16	3	12	3	12
			(2.1.6)		161		174

2.1.1 How many criteria has the design team determined for this design problem? (1)

2.1.2 Explain the term *weighting factor* as used in the concept selection matrix. (2)

2.1.3 What is the weighting factor for Cost? (1)

2.1.4 Determine the rating factor for Safety for Concept 3. (1)

2.1.5 Determine the concept total for Reliability for Concept 2. (1)

2.1.6 Calculate the total score for Concept 1. (2)

2.1.7 Which mistake did the design team make in this concept selection matrix? (1)

2.1.8 What should the design team do to rectify the mistake found in QUESTION 2.1.7? (2)

2.2 Complete the following sentences by using the words in the list below. Write only the missing word or words next to question number (2.2.1–2.2.3) in the ANSWER BOOK.

scale; mock-up; prescriptive; standards; simulation; equations

2.2.1 Mathematical modelling uses … to predict certain quantities.

2.2.2 When a computer program mimics a real process, it is called …

2.2.3 A … is used to show what a product will look like.

(3 × 1) (3)

Copyright reserved

2.3 Give THREE consequences of engineers not complying with proper design procedures. (3)

2.4 You are a project leader and planning a brainstorming session to generate ideas or solutions for a design problem.

Explain the entire process to generate and finally sift ideas using a brainstorming session. (7)

2.5 Briefly explain the next step in the design process when a prototype of a design solution has been built. (1)
[25]

QUESTION 3

3.1 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 (3.1.1–3.1.5) in the ANSWER BOOK.

3.1.1 The last section of a technical report is the …

A conclusion.
B introduction.
C appendix.
D recommendation.

3.1.2 Which ONE of the following pieces of information will NOT be found on the title page of a technical report:

A Name of the writer of the report
B Date on which the report was written
C Findings of the report
D Title of the report

3.1.3 When writing a technical report, the writer must ensure that …

A facts are left out.
B references are not mentioned.
C the report is organised logically.
D graphics and illustrations are not clear.

3.1.4 The recommendation section of a technical report contains …

A suggestions for the rectification of the problem.
B a summary of the findings of the investigation.
C the methods used to research the problem.
D background to the report.

Copyright reserved

3.1.5 The conclusion section of a technical report follows the …

A introduction.
B discussion.
C summary.
D references.

(5 × 1) (5)

3.2 A workshop consists of a milling machine, CNC lathe and shaping machine.

Consider the following sequence of events in the workshop and draw a block diagram (arrows included) to graphically represent the sequence of events:

- The worktable receives three different workpieces.
- Workpiece 1 is sent to the milling machine after which it will go to the shaping machine and then to quality assurance.
- Workpiece 2 is sent to the CNC machine after which it will go to the milling machine and then to quality assurance.
- Workpiece 3 is sent to the shaping machine after which it is sent to quality assurance.
- Workpieces that failed the quality assurance inspection are sent to the scrap heap.
- Workpieces that passed the quality assurance inspection are sent to the stockpile. (11)

3.3 Verbal presentation is an example of audiovisual presentation techniques.

State FIVE other techniques used to give presentations to management. (5)

3.4 Explain the difference in operation between the AND and OR logical networks. (2)

3.5 What do the following symbols or acronyms on engineering drawings stand for:

3.5.1 Ø

3.5.2 R (2 × 1) (2)
[25]

QUESTION 4

4.1 List SIX input devices used in computing. (6)

Copyright reserved

4.2 A spreadsheet is a software program that has the ability to do various types of calculations, such as the sum, average, etc. of a range of numbers.

Analyse the incorrect Microsoft Excel formulae below and rectify the mistakes. Write the answer next to the question number (4.2.1–4.2.4) in the ANSWER BOOK.

4.2.1 =SUM(A1;A5)

4.2.2 A1+A2+A3+A4+A5

4.2.3 =HIGH(A1:A5)

4.2.4 =AVE(A1:A5) (4 × 1) (4)

4.3 Which key on a QWERTY keyboard accesses the Help function? (1)

4.4 Choose a description from COLUMN B that matches a term in COLUMN A. Write only the letter (A–L) next to the question number (4.4.1–4.4.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
4.4.1	Flip-flop	A	memory that can be electrically erased and reprogrammed
4.4.2	Bit	B	input device
4.4.3	Hard disk	C	storage that cannot be accessed directly by the processor
4.4.4	RAM	D	volatile memory situated outside processor
4.4.5	ROM	E	stores data on rotating platters with magnetic surfaces
4.4.6	Primary storage	F	electronic circuit that has two stable states
4.4.7	Optical storage	G	output device
4.4.8	Flash memory	H	memory not cleared when power is shut down
4.4.9	Secondary storage	I	memory contents change continuously
4.4.10	Processor cache	J	disk drive that uses laser light to read and write data
		K	increases performance of the computer
		L	binary value of either one or zero

(10 × 1) (10)

4.5 Agile development is an example of a complex software system and is an iterative software method used for project development. One of the principles of agile development is self-organising teams.

State FOUR other principles of agile development. (4)
[25]

TOTAL: 100

NCV

Copyright reserved