higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ROADS
NQF LEVEL 4

(12030534)

22 November 2018 (Y-Paper)
13:00–16:00

This question paper consists of 5 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. Keep subsections of question together.
5. Rule off across the page on completion of each question.
6. ALL work you do not want to be marked must be clearly crossed out.
7. Write neatly and legibly.

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QUESTION 1: ROAD DRAINAGE

1.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (1.1.1–1.1.10) in the ANSWER BOOK.

1.1.1 Longitudinal drains are found alongside a road and between lanes running in opposite directions.

1.1.2 A culvert is normally used to channel water beneath a road, railroad and embankment, from the upper side to the downstream side of the road.

1.1.3 The purpose of sub-surface drainage is to collect and direct water and excess moisture away from the underlying layers of the road.

1.1.4 Manholes are services or inspection cambers found at regular intervals along below ground storm water drains.

1.1.5 The trenches for slotted pipes are dug at depths of less than 200 mm below the surface of the road.

1.1.6 Sand blasting is a thin layer of fine sand under the road layers used collect and convey seepage water.

1.1.7 A transverse fall is at a crosswise direction and at right angle to the long axis of the road surface.

1.1.8 Aquaplaning occurs when a thin layer of water builds up between the tyres and surface of the road.

1.1.9 V-drains are used in a flat environment where there is plenty of room to incorporate a shallow roadside.

1.1.10 Geofabric material allows water and moisture in soil to seep through the material without the soil being compromised.

(10 × 1) (10)

1.2 To prevent the erosion and deterioration of underlying road layers caused by water, one needs to design and construct a efficient sub-surface drainage system for the road.

1.2.1 Explain how sub-surface drainage systems need to be constructed.

1.2.2 Name THREE types of materials that can be used to manufacture pipes suitable for sub-soil drainage systems.

(2 × 3) (6)

1.3 The erosion of underlying road layers caused by various sources of water can be a major problem to the underlying road layers, as well as to the road surface.

List FIVE problems that water and erosion can cause to the underlying road layers as well as to the surface of the road. (5)

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1.4 Describe what a sand blanket is and what it is used for. (2)

1.5 Gabions can be used for a number of purposes when doing road construction works.
State FOUR purposes of gabions when used in road construction works. (4)

1.6 Identify THREE road carriageway / surfacing problems that can arise due to badly designed and damaged roads. (3)
[30]

QUESTION 2: ROAD PAVEMENT

2.1 Define the term base course in relation to a flexible pavement. (2)

2.2 Name FIVE important stages to follow when building a labour intensive concrete pavement. (5)

2.3 It is important to know which type of block paving should be used on a specific road.
The table below shows different concrete thickness for paving blocks, whereas the required application or use and compressive strength has been omitted from the table.
Re-draw the table in your ANSWERING BOOK and fill in the omitted information in relevant spaces as shown in the table below.

	Concrete thickness	Application / Use	Compressive strength
2.3.1	< 40mm thickness		
2.3.2	50-55mm thickness		
2.3.3	60mm thickness		
2.3.4	70-80mm thickness		
2.3.5	> 100mm thickness		

(2 × 5) (10)

2.4 Name FOUR types of equipment that will be required when conducting a bitumen penetration test. (4)

2.5 Jointing / grouting sand is required to resist certain stresses when used between the paving blocks.
What are TWO of these types of stress that jointing sand is required to resist. (2)

2.6 Give FIVE functions of edge restraints (kerbs) when used in concrete block paving. (5)

2.7 List FIVE personal protective equipment that must be worn when working with heated bitumen. (5)

2.8 Name FOUR properties of bitumen. (4)

2.9 What are the THREE primary materials used to produce single seal? (3)
[40]

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QUESTION 3: ROAD MAINTANANCE AND REHABILITATION

3.1 State FIVE reasons why a road reserve needs continuous maintenance. (5)

3.2 What are the THREE main causes of edge breaks developing on a road surface? (3)

3.3 The surfacing layer of an asphalt road surface may be exposed to minor damage that may cause some problems that need to be attended to when not maintained and repaired regularly.

Name FOUR of these problems. (4)

3.4 Give TWO reasons why a pothole can increase in size and depth? (2)

3.5 Describe TWO basic measures that need to be followed when sealing cracks on asphalt road surface. (2)

3.6 What safety and precautionary measures need to be in place to ensure that traffic will move safely and securely through an area where road works is in progress? (2)

3.7 What are the THREE processes that hot-in place recycling asphalt consist of? (3)

3.8 State THREE ways that recycled asphalt can be used for rehabilitation or reconstruction of asphalt surfacing. (3)

3.9 Describe each one of the following types of road furniture and where it will be used.

3.9.1 Traffic cone. (2)

3.9.2 Guardrail barrier (2)

3.9.3 Delineator signs (2)

[30]

TOTAL: 100

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