higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRICAL WORKMANSHIP

NQF LEVEL 4

(12041014)

8 March 2018 (Y-Paper)
13:00–16:00

This question paper consists of 6 pages.

NCV

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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. Write neatly and legibly.

NCV

QUESTION 1

1.1 Electricity is one of the major hazards in the workplace.

1.1.1 State THREE factors that determine the extent of injury caused by an electric shock.

1.1.2 State THREE basic ways in which an electric current travels through the body.

(2 × 3) (6)

1.2 There are several ways in which employees may get injured by a machine.

State THREE ways in which injury may be sustained by employees working on machinery. (3)

1.3 Briefly explain the basic function of an adjustable guard on a machine, e.g. a band saw. (2)

1.4 Explain how you would perform machine or equipment isolation. Include equipment that stores an electrical charge. (4)

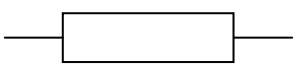
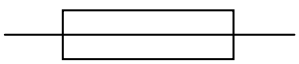
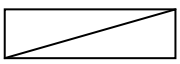
1.5 Risk assessment, workplace hazard identification and control are important and ongoing processes.

State FIVE situations when the above activities should be done. (5)

[20]

QUESTION 2

2.1 Choose a word/term from COLUMN B that matches a symbol in COLUMN A. Write only the letter (A–F) next to the question number (2.1.1–2.1.5) in the ANSWER BOOK.

COLUMN A	COLUMN B
2.1.1 	A distribution board
2.1.2 	B fuse
2.1.3 	C heater
2.1.4 	D inductor
2.1.5 	E resistor
	F overlay relay

(5 × 1) (5)

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2.2 Lighting systems are divided into two main groups, i.e. automatic control and manual control.

List THREE subgroups into which automatic control is divided. (3)

2.3 One of the causes of electrical surges is lightning strikes which inject larger currents than usual into the electrical system.

2.3.1 Briefly explain what an electrical surge is. (2)

2.3.2 Where do electrical surges occur? (1)

2.3.3 Draw the IEC symbol of a surge protection device. (1)

2.4 Regulation 5.4.3 refers to surge protection.

2.4.1 Where should surge protection devices (SPDs) be installed?

2.4.2 Give TWO reasons why surge protection devices should be installed.

(2 × 2) (4)

2.5 Calculate the cross-sectional area of an XLPE-insulated cable with aluminium conductors if the fault current is 1,2 kA for a maximum time of 2 seconds.

NOTE: k = 116 (4)

[20]

QUESTION 3

3.1 Various classes of light fittings are available in the market for different applications, i.e. domestic, industrial, commercial and outdoor use.

3.1.1 Which type of lighting has 80% of the light reflected upwards by diffusing reflectors, whereby the ceiling acts as a source of light and evenly distributes it over the surface, providing shadowless illumination? (1)

3.1.2 Where would this light be most useful? State any ONE area of application. (1)

3.2 The term *illuminance* is used to specify the amount of light falling onto a surface and is measured in lumens per square metre (lumen/m^2), but is more often referred to as lux (lx).

Give any TWO other terms which refer to illuminance. (2)

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3.3 Low-voltage halogen lamps have become increasingly popular.

3.3.1 List THREE reduced voltage ranges in which they are available. (3)

3.3.2 Where is low-voltage lamps mostly used? (1)

3.3.3 What type of transformer should be used in low-voltage lamps in order for them to operate properly? (1)

3.4 Sodium vapour lamps generate light by the excitation of sodium metal in a discharge through a mixture of neon and argon gases and are generally employed in street light applications.

Redraw the TABLE below in the ANSWER BOOK and complete it by filling in THREE advantages and THREE disadvantages of low-pressure sodium vapour lamps.

ADVANTAGES	DISADVANTAGES
(i)	(iv)
(ii)	(v)
(iii)	(vi)

(6 × 1) (6)

3.5 Show, by means of a neat, labelled diagram, how you would connect three single fluorescent light fittings to a three-phase supply to minimise the stroboscopic effect. (5)

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QUESTION 4

4.1 Briefly describe the TWO main purposes of a polarity test. (2)

4.2 As a technician you are required to perform various tests on different appliances.

Explain the FOUR basic steps to follow in the procedure you will carry out to test for the correct polarity in an appliance.

NOTE: The appliance has already been disconnected from the power supply. (4)

4.3 State any FOUR typical questions you may ask the customer before commencing with fault-finding and repairs in domestic appliances. (4)

4.4 State SEVEN of the fault-finding techniques used to identify the cause of a fault and to locate the faulty components in domestic appliances and power tools. (7)

4.5 After fault-finding and repairs have been completed, a tag should be attached to the relevant equipment to make identification easier for the user and to provide a history for further repairs.

State THREE important bits of information that should appear on the tag. (3)

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QUESTION 5

5.1 Motors are classified according to the type of housing enclosure used and are dependent on conditions under which they are used.

List FIVE types of motor enclosures in use and briefly describe in which kind of environment each type is used. (10)

5.2 A basic disadvantage of using a belt-drive coupling on a motor and its load is slippage.

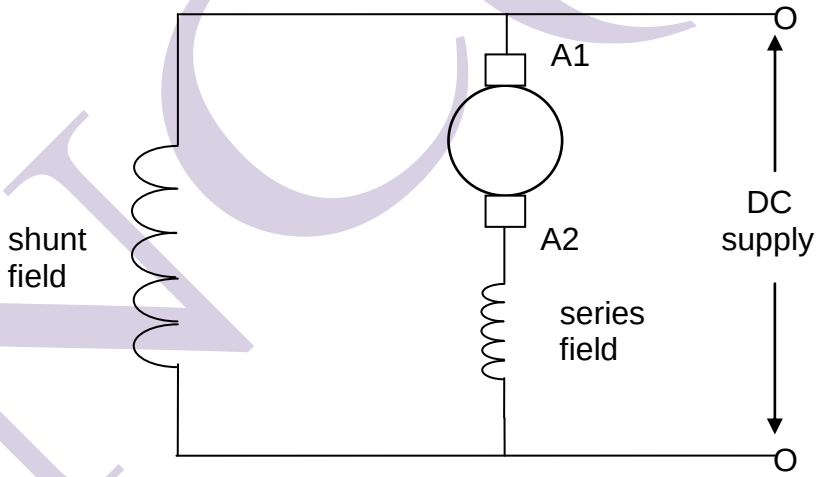
5.2.1 Name the coupling type which is the preferred method to overcome this problem. (1)

5.2.2 The preferred method you mentioned in QUESTION 5.2.1 has the advantage of transmitting mechanical power.

Name the coupling part which transmits this power. (1)

5.2.3 Briefly explain the operation of the coupling type referred to in QUESTION 5.2.1 and QUESTION 5.2.2. (2)

5.3 DC motors are classified according to the way the connections are made of the field windings with the armature and supply.



5.3.1 Name the type of DC motor in the figure above. (1)

5.3.2 Name TWO applications of the motor in the figure above. (2)

5.4 Carbon is a popular material used in the manufacturing of motor brushes.

State THREE effects that high-brush pressure will have on a DC machine. (3)

[20]

TOTAL: 100

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