higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

ELECTRICAL SYSTEMS AND CONSTRUCTION
NQF LEVEL 2

(12041032)

12 March 2018 (X-Paper)
09:00–12:00

This question paper consists of 8 pages.

NCV

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.

NCS

QUESTION 1

1.1 Draw the symbol used to indicate double-insulated appliances or equipment. (1)

1.2 A number of tests must be conducted on an installation.

Match the descriptions in COLUMN B to the tests in COLUMN A. Write only the letter (A–F) next to the question number (1.2.1–1.2.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.2.1	Elevated voltage on neutral	A	ensures that the volt drop from the supply to the furthest point of consumption does not exceed 5%
1.2.2	Polarity test	B	connects one lead of the test instrument to the consumer's earth terminal and the other to all metal parts of the installation
1.2.3	Voltage at available load	C	ensures that the earth-leakage relay operates correctly
1.2.4	Insulation resistance	D	ensures that the phase conductor is connected to the centre termination of an Edison screw lamp holder
1.2.5	Continuity of bonding conductor	E	checks whether the insulation properties of the insulating material is defective
		F	measures the voltage between the supply neutral and earth

(5 × 1) (5)

1.3 List THREE items to check during a visual inspection on an electrical installation. (3)

1.4 Draw a neat, fully labelled circuit diagram to show how TWO bulbs can be controlled from THREE different positions in a passage. The diagram should include a distribution board showing ALL components required for the installation. (10)

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1.5 An earth-leakage relay needs to be tested regularly to ensure that the sensitivity of the unit is correct.

1.5.1 Which test instrument could be used to test an earth-leakage relay? (1)

1.5.2 How does one conduct the above test? (3)

1.5.3 While conducting the test, the earth-leakage relay tripped at a current of 40 mA.

Is this reading acceptable? Motivate the answer. (2)

[25]

QUESTION 2

2.1 List THREE applications where flexible conduit can be used. (3)

2.2 Complete the following sentences by filling in the missing word or words. Write only the word or words next to the question number (2.2.1–2.2.5) in the ANSWER BOOK.

2.2.1 A joint must be ... and mechanically sound.

2.2.2 The joint must not affect the … or earth continuity of the conductor.

2.2.3 The joint must be protected against ...

2.2.4 The strands of a stranded conductor must not be allowed to … while joining.

2.2.5 The joint must be accessible for …

(5 × 1) (5)

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2.3 A cable gland is used to provide entry for a cable into an enclosure and mechanically attaches the cable to the enclosure.

2.3.1 Give FOUR criteria to consider when selecting a cable gland. (4)

2.3.2 Use the table below to determine the cable gland size required for a 6 mm² three-core steel-wire armoured cable.

Cable size (mm²)	**Gland size for cable size or number of cores**		
	Number of cores		
	2	3	4
1,5	0	0	0
2,5	0	0	0/1
4	0/1	1	1
6	1	1	1/2
10	1/2	2	2
16	2	2	3

(1)

2.4 An electrician just completed installing ALL the wireways in a new installation. He is now required to draw conductors into these wireways to complete the installation.

2.4.1 What tool should he use to draw the conductors into the wireways? (1)

2.4.2 Explain how to use the tool in QUESTION 2.4.1 to draw the conductors into the wireways. (4)

2.5 Name TWO types of cable trays that can be used to support or fasten cables over long distances. (2)

[20]

QUESTION 3

3.1 Study FIGURE 1 below and answer the questions.

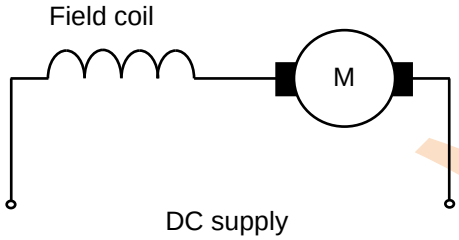


FIGURE 1

3.1.1 Identify the DC motor shown in FIGURE 1. (1)

3.1.2 Show, by means of a diagram, TWO ways that can be used to reverse the direction of rotation of the motor in FIGURE 1. (2 × 3) (6)

3.2 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (3.2.1–3.2.5) in the ANSWER BOOK.

3.2.1 A universal motor operates on both AC and DC supplies.

3.2.2 A shaded-pole motor has a main winding and an auxiliary winding.

3.2.3 AC motors require less maintenance than DC motors.

3.2.4 When doing maintenance on DC motors it is not required to perform lockout and tag-out procedures.

3.2.5 When an AC induction motor is not running the centrifugal switch will be in the open position.

(5 × 1) (5)

3.3 An induction motor in a factory was disconnected and brought to the workshop for cleaning and maintenance. One of the tests that must be conducted is a continuity test on the windings of the motor.

3.3.1 Name the test instrument and scale that should be used to conduct the test. (2)

3.3.2 After conducting the test, an infinity reading was recorded on both windings of the motor.

What does this reading indicate about the condition of the windings? (1)

[15]

QUESTION 4

4.1 A faulty transformer needs to be tested. After the completion of a continuity and a voltage test, the insulation resistance of the transformer still needs to be tested.

4.1.1 Name the test instrument that can be used to perform the test. (1)

4.1.2 When conducting the test, must the power be on or off? (1)

4.1.3 Explain how to conduct the test. Indicate where the test leads are placed. (3)

4.1.4 What would an acceptable reading be? (1)

4.2 Name FOUR tests that are performed on circuit breakers to ensure they are in good working condition. (4)

4.3 A geyser fails to give hot water.

Name FIVE components in the geyser circuit to test while finding the fault. (5)
[15]

QUESTION 5

5.1 Give FIVE advantages of prepaid meters. (5)

5.2 Give FIVE reasons why it is important to communicate the work schedule to ALL affected parties. (5)

5.3 What is the purpose of an energy meter as used in a domestic installation? (2)

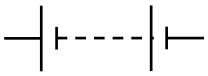
5.4 Timer switches are useful in controlling energy.

Give THREE examples where timer switches can be used in a domestic installation. (3)
[15]

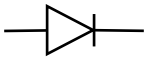
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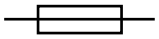
QUESTION 6

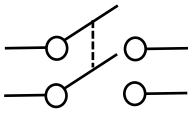
6.1 Identify each of the following IEC symbols used in renewable energy circuits:

6.1.1 

6.1.2 

6.1.3 

6.1.4 

6.1.5 

(5 × 1) (5)

6.2 Study FIGURE 2 below and answer the questions.

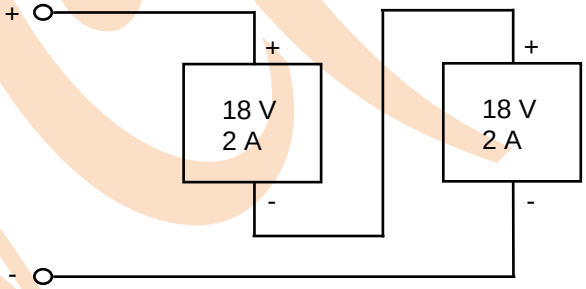


FIGURE 2

6.2.1 Name the connection of the PV modules in the above circuit. (1)

6.2.2 What would the total voltage for the configuration be? (2)

6.2.3 What would the total current flow for the configuration be? (2)

[10]

TOTAL: 100

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