

# End-point Assessment Knowledge Test

Please write clearly in block capitals below	
Company name	
First name (s)	
Last name (s)	
Date of birth	
Apprentice number	
Apprentice signature	
Date of knowledge test	

**Level: 4**  
**Standard: Electrical Power Networks Engineer  
Apprenticeship**  
**Duration: 1 hour (60 minutes)**

## Materials

For this paper you must have:

- Pens
- Calculators
- The test is open book. The apprentices are **allowed** to have available and refer to any materials that they wish to consult during the test, including training manuals, company policies and procedures and work logs, but **MUST NOT** have access to any internet search engines

## Instructions

- Use black or blue ink or black ball-point pen
- Fill in the boxes on the front of the page
- Answer **all** questions
- There are questions, possible answers as well as a column for you to mark your answer
- Mark your answer with an  against the possible answer you think is correct- if you wish to change your answer please put a line through  and re-select with another
- Only one answer per question allowed. Answers which do not follow the rules of selection will be disallowed. This may impact on the grade awarded
- Do all rough work in this answer book
- There is spare paper on page 4 that you can use but **MUST NOT** be removed
- Additional spare paper will not be provided
- All questions are open book

## Sample:

London is the capital of....

Example Question		
London is the capital of...		
Possible answers		Answer
a)	Wales	<del>X</del>
b)	Scotland	
c)	Northern Ireland	
d)	England	X

## Information

- The marks for questions are 1 mark each
- There are 40 questions in total
- All questions should be attempted

## Advice

- You are not permitted to leave the examination room for the duration of the assessment
- Do not spend too long on one question
- Read all questions thoroughly before starting your examination
- Mobile phones and SMART watches must not be taken into the examination room. The examination must be conducted under examination conditions i.e., you may not speak to other candidates, if you have a question raise your hand and the invigilator will attend
- Cheating: you will be asked to leave the examination room and will be classified an automatic failure and referred to your employer

**THIS PAPER MUST NOT BE COPIED OR CIRCULATED WITHOUT THE WRITTEN PERMISSION OF THE EUIAS**

**Do not turn over the page or commence the knowledge test until the invigilator instructs you to**

You can use this page to carry out any work but must not remove from the practice assessment paper

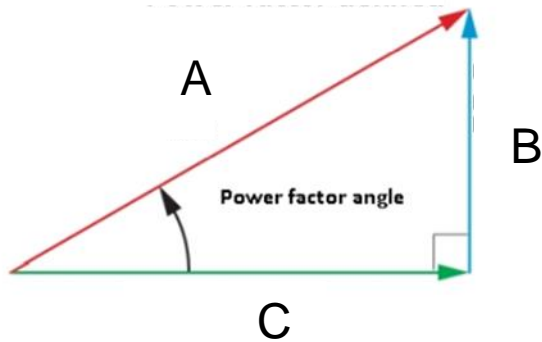
<b>Question 1</b>		
When considering resistors in a series circuit, which statement is correct?		
<b>Possible answers</b>		<b>Answer</b>
a)	The same potential difference occurs across all resistors	
b)	The same current flows in all resistors	
c)	Different current flows in all resistors	
d)	The sum of the potential difference across each resistor is half the value of the supply voltage	

<b>Question 2</b>		
When considering resistors in a parallel circuit, which statement is correct?		
<b>Possible answers</b>		<b>Answer</b>
a)	A different potential difference occurs across all resistors	
b)	The same current flows in all resistors	
c)	The current in each resistor is equal to its resistance	
d)	The sum of the currents in the individual resistors is equal to the supply current	

<b>Question 3</b>		
Which ONE of the following is an effect produced by a network capacitor bank?		
<b>Possible answers</b>		<b>Answer</b>
a)	Improves voltage drop and regulation on the system	
b)	Stores power indefinitely providing an alternative to batteries	
c)	Increases line losses and reduces network capacity	
d)	Increases reactive power on system motors and other loads	

**Question 4**

Refer to the Power Factor diagram below. What do the letters A, B and C represent?



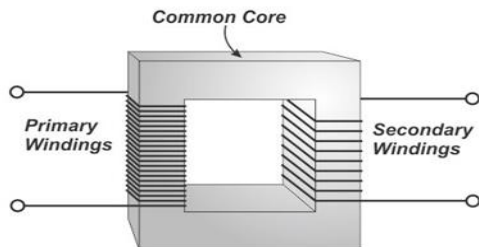
Possible answers		Answer
a)	A = Apparent Power, B = Real Power and C = Reactive Power	
b)	A = Reactive Power, B = Apparent Power and C = Real Power	
c)	A = Apparent Power, B = Reactive Power and C = Real Power	
d)	A = Reactive Power, B = Real Power and C = Apparent Power	

[Turn to page 7 for question 5]

### Question 5

The number of secondary windings on a transformer connected to an alternating current (AC) has been decreased.

What effect will this have on the output voltage?



#### Possible answers

#### Answer

a)	Decrease the output voltage	
b)	Decrease the input voltage	
c)	Increase the output voltage	
d)	Increase the input voltage	

### Question 6

For a balanced three-phase system, which ONE of the following is the formula for calculating the PHASE voltage of a STAR connected transformer?

Abbreviations below stand for:

$V_P$  - Phase Voltage

$V_L$  - Line Voltage

$I_L$  - Line Current

$I_P$  - Phase Current

$\sqrt{\phantom{x}}$  - Root 3 (root of three)

#### Possible answers

#### Answer

a)	$V_P = V_L \div \sqrt{3}$	
b)	$V_P = V_L$	
c)	$V_P = I_L \div I_P$	
d)	$V_P = V_L - \sqrt{3}$	

<b>Question 7</b>		
In a balanced star-connected three-phase system the value of the phase current:		
<b>Possible answers</b>		<b>Answer</b>
a)	varies above and below the line current	
b)	is higher than the line current	
c)	is a third less than the line current	
d)	is equal to the line current	

<b>Question 8</b>		
In a balanced three-phase system with delta-connected load and 415 V line voltage, What would the value of the phase voltage be?		
<b>Possible answers</b>		<b>Answer</b>
a)	0 V	
b)	240 V	
c)	415 V	
d)	440 V	

<b>Question 9</b>		
In a balanced three-phase system with a star-connected load and 10 A line current, what would be the value of the phase current?		
<b>Possible answers</b>		<b>Answer</b>
a)	5.77 A	
b)	10 A	
c)	17.3 A	
d)	30 A	

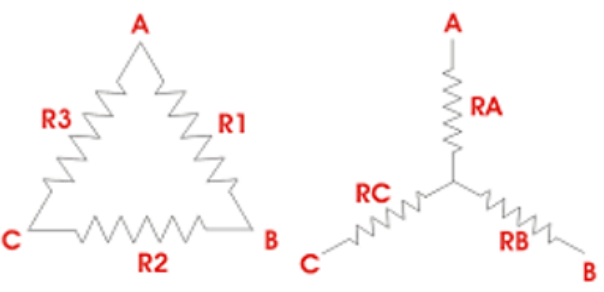


<b>Question 10</b>		
Which ONE of the following describes the effect of harmonics on a three-phase electrical network?		
<b>Possible answers</b>		<b>Answer</b>
a)	The networks current and voltage are distorted and deviate from their standard sinusoidal waveforms	
b)	The networks current and voltage are regulated and conform to their standard sinusoidal waveforms	
c)	The networks current is decreased, and the voltage increased proportionally to regulate their standard sinusoidal waveforms	
d)	The networks current and voltage is increased causing network problems and system faults	

<b>Question 11</b>		
Which harmonic typically causes neutral current to increase most significantly?		
<b>Possible answers</b>		<b>Answer</b>
a)	The third harmonic	
b)	The fifth harmonic	
c)	The seventh harmonic	
d)	The twelfth harmonic	

<b>Question 12</b>		
In a balanced three-phase system, what would be the value of the neutral current?		
<b>Possible answers</b>		<b>Answer</b>
a)	Zero	
b)	Line current	
c)	Phase current	
d)	3 x phase current	

Question 13		
Three-phase transformers should only be connected in parallel under which ONE of the following conditions?		
Possible answers		Answer
a)	When they are identical in all respects	
b)	When they have exactly the same losses	
c)	When permission is obtained from the manufacturer	
d)	When they have the same secondary voltages	

Question 14		
Refer to the diagram below.		
In the order shown, which transformer wiring configurations does this diagram represent?		
		
Possible answers		Answer
a)	Single-phase star, single-phase delta	
b)	Three-phase star, three-phase delta	
c)	Single-phase delta, single-phase star	
d)	Three-phase delta, three-phase star	

### Question 15

The UK's electricity is typically generated in large commercial power stations.

At what voltage is it generated?

Possible answers		Answer
a)	11 kV	
b)	25 kV	
c)	132 kV	
d)	400 kV	

### Question 16

At what voltage is the transmission of electricity across the UK primarily conducted?



Possible answers		Answer
a)	11 kV	
b)	132 kV	
c)	415 V	
d)	400 kV	

<b>Question 17</b>		
What are the typical voltage tolerances for high voltage (up to 132 kV) power networks?		
<b>Possible answers</b>		<b>Answer</b>
a)	High voltage $\pm$ 3% of nominal voltage	
b)	High voltage $\pm$ 6% of nominal voltage	
c)	High voltage +6% to -10% of nominal voltage	
d)	High voltage $\pm$ 10% of nominal voltage	

<b>Question 18</b>		
Which statement describes the typical method for controlling the output voltage on a 33/11 kV transformer to keep it within its statutory limits?		
<b>Possible answers</b>		<b>Answer</b>
a)	An automatic voltage control relay monitors the transformers output voltage and regulates the voltage via a tap changer	
b)	A control engineer monitors the transformers output voltage and regulates the voltage via an automated tap changer	
c)	A current transformer (CT) monitors the transformers output voltage and regulates the voltage via a tap changer	
d)	An automated tap changer monitors the transformers output and regulates the voltage via an automatic voltage control relay	

<b>Question 19</b>		
An engineer needs to determine the electrical rating of a switchgear, that will be used on a power network.		
What critical factor should the engineer consider?		
<b>Possible answers</b>		<b>Answer</b>
a)	The manufacturer of the switchgear to be used	
b)	The location of the switchgear in the electrical circuit	
c)	The proximity of commercial and domestic buildings	
d)	The ability to operate the switchgear manually or remotely	

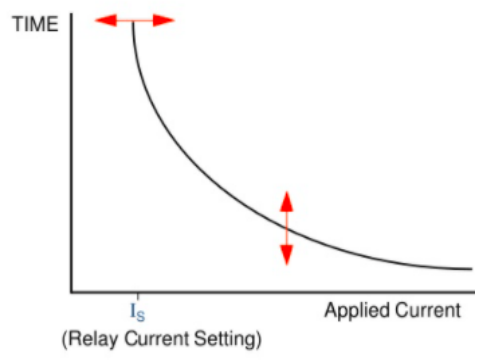
<b>Question 20</b>		
'A low voltage network which has the neutral bonded to earth at several different points in the system.'		
What type of earthing system is the above known as?		
<b>Possible answers</b>		<b>Answer</b>
a)	Terra Neutral Split system	
b)	Terra Neutral Terra Firma system	
c)	Protective Multiple Earthing system	
d)	Earth Loop Impedance system	

<b>Question 21</b>		
A transformer which consists of a single winding and is used to step up or step down a constant supply voltage.		
What type of transformer is this known as?		
<b>Possible answers</b>		<b>Answer</b>
a)	Current transformer	
b)	Voltage transformer	
c)	Earthing transformer	
d)	Auto-transformer	

<b>Question 22</b>		
What would be the effect of a fault on the protection of a low voltage network with a low earth loop impedance value?		
<b>Possible answers</b>		<b>Answer</b>
a)	The fault current would take longer to activate the protection, the lower the value	
b)	The fault current would activate the protection faster, the lower the value	
c)	The fault current would activate the protection at the same time regardless of the value	
d)	The fault current would not activate the protection if the value was below the UK standard	

<b>Question 23</b>		
When considering network protection there are devices that provide an advantage of being able to support overcurrent for a period of time and be reset.		
Which device would provide this advantage?		
<b>Possible answers</b>		<b>Answer</b>
a)	High Rupturing Capacity (HRC) fuses	
b)	Rewireable fuses	
c)	Contactors relays	
d)	Rewireable relays	

<b>Question 24</b>		
Which ONE of the following is an example of a 'Rise in Earth Potential' (ROEP)?		
<b>Possible answers</b>		<b>Answer</b>
a)	A ROEP is created by increasing the number of earth electrodes in a substation to prevent system faults	
b)	A ROEP is a phenomenon which occurs during long periods of high voltage switching in a substation which stresses the earth system	
c)	A ROEP is created by bonding all auxiliary steelwork to earth in a substation together to prevent system faults	
d)	A ROEP occurs when a large current flows to earth through the effects of a high voltage fault	

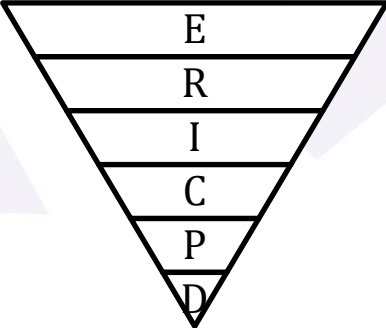
<b>Question 25</b>		
A relay operates by the principle that the higher the current value the lesser time it will take the relay to operate.		
What protocol does this follow?		
		
<b>Possible answers</b>		<b>Answer</b>
a)	Immediate Delay Measured Sequence (IDMS) protocol	
b)	Inverse Definite Minimum Time (IDMT) protocol	
c)	Inverse Decision Time Measure (IDTM) protocol	
d)	Individual Delayed Time Sequence (IDTS) protocol	

<b>Question 26</b>		
Which piece of network equipment does the following sentence describe?		
'It reduces earth fault current and limits the amount of fault current returning to the transformer'.		
<b>Possible answers</b>		<b>Answer</b>
a)	A voltage transformer	
b)	A switch fuse	
c)	A neutral earthing resistor	
d)	A protective multiple earth	

<b>Question 27</b>		
Voltage transformers (VT) can be used for circuit control, safety protection and measurement.		
Which ONE of the following describes the principle of VTs operation?		
<b>Possible answers</b>		<b>Answer</b>
a)	A VT can be used to step down the voltage of the system to a value which is acceptable to the lower rating of meters and relays	
b)	A VT can be used to step up the voltage of the system to a value which is acceptable to the higher rating of meters and relays	
c)	A VT can be used to convert the alternating waveform of the system to a direct waveform to supply meters and relays	
d)	A VT can be used to accept the voltage of the system and connect it directly to the higher rated meters and relays	



<b>Question 28</b>		
Which ONE of the following describes the typical capabilities of a high voltage switch?		
<b>Possible answers</b>		<b>Answer</b>
a)	The switch is load making but not load breaking or fault making	
b)	The switch is non-load making but is load breaking and fault making	
c)	The switch is load making and breaking, and fault making	
d)	The switch is non-load making or breaking but is fault making	

<b>Question 29</b>		
ERICPD is an acronym used by health and safety organisations as a risk assessment model to help prioritise health and safety measures in the workplace.		
What does ERICPD stand for?		
		
<b>Possible answers</b>		<b>Answer</b>
a)	Eliminate, Report, Investigate to Control Potential Danger	
b)	Eliminate, Remove, Insulate, Caution, Protect and Discipline	
c)	Eliminate, Reduce, Isolate, Control, PPE and Discipline	
d)	Eliminating Risks Insures Complete Protection from Danger	

<b>Question 30</b>		
Which ONE of the following identifies the primary purpose of a risk management strategy?		
<b>Possible answers</b>		<b>Answer</b>
a)	A risk management strategy provides a cost efficient approach to identifying, assessing, and managing the Company's financial risk	
b)	A risk management strategy provides a timely and effective method of measuring the exposure to risk in the event of an incident	
c)	A risk management strategy provides a structured and coherent approach to identifying, assessing, and managing risk	
d)	A risk management strategy provides an auditable process which protects a Company from any liability in the event of an incident	

<b>Question 31</b>		
Which ONE of the following describes the primary purpose of the Electricity at Work Regulations 1989?		
<b>Possible answers</b>		<b>Answer</b>
a)	They aim to prevent the loss of time or production in the process of maintaining an electrical supply in a work environment	
b)	They aim to prevent death or injury to any person from electrical causes while working or in a work environment	
c)	They aim to improve electrical working practices to provide a more efficient use of tools and equipment in a work environment	
d)	They aim to reduce death or injury to an acceptable level to any person from electrical causes while working or in a work environment	

<b>Question 32</b>		
A 'permit-to-work' system is a formal written system used to control certain types of work that are potentially hazardous.		
Identify the elements which must be included on a 'permit-to-work' document?		
<b>Possible answers</b>		<b>Answer</b>
a)	Date of issue, description of work, points of contact, signature of document receiver	
b)	Date and time of issue, location of work, points of isolation, signatures of issuer and receiver	
c)	Date and time of issue, cost of work, points of switching, signature of Company director	
d)	Date and time of issue, description of work, points of switching, signatures of the working party	

<b>Question 33</b>		
In relation to commercial projects, the Construction Design and Management (CDM) Regulations 2015, require that under certain circumstances construction work is notifiable in writing to the HSE.		
Which statement identifies ONE of those circumstances?		
<b>Possible answers</b>		<b>Answer</b>
a)	Where planned construction work will last longer than 20 working days	
b)	Where planned construction work will last longer than 30 working days	
c)	Where planned construction work will last longer than 40 working days	
d)	Where planned construction work will last longer than 50 working days	

<b>Question 34</b>		
<p>The Electricity Safety, Quality and Continuity Regulations 2002 (ESQCR) places duties to report certain incidents that may involve the safety of those not employed by the duty holder.</p> <p>Which of the following identifies ONE of these incidents?</p>		
<b>Possible answers</b>		<b>Answer</b>
a)	Any single interruption of supply of 5 megawatts or more at the time of the interruption for a period of one hour or longer	
b)	Any single interruption of supply of 1 megawatt or more at the time of the interruption for a period of five hours or longer	
c)	Any multiple interruption of supply of 20 megawatts or more for more than two 5 minutes periods	
d)	Any single interruption of supply of 20 megawatts or more at the time of the interruption for a period of one hour or longer	

<b>Question 35</b>		
<p>Which statement states the principles of maintenance as defined by the Electricity at Work Regulations 1989?</p>		
<b>Possible answers</b>		<b>Answer</b>
a)	As may be financially viable to prevent danger, all systems shall be maintained so as to prevent, so far as is reasonably practicable, such danger	
b)	As may be necessary to improve performance, all systems shall be maintained on an annual basis to prevent any loss of power to the system	
c)	As may be convenient to prevent danger, all systems shall be isolated to prevent injury to operatives working on the system, based on the time and cost of the maintenance operation	
d)	As may be necessary to prevent danger, all systems shall be maintained so as to prevent, so far as is reasonably practicable, such danger	

<b>Question 36</b>		
What is meant by the term achieving 'Safety from the System'?		
<b>Possible answers</b>		<b>Answer</b>
a)	Safeguards that all equipment shall be made dead, prior to any work activities being permitted on the electrical system	
b)	The condition which safeguards tools and equipment from the dangers of work being conducted on the electrical system	
c)	The condition which safeguards persons working on or near to equipment from the dangers which are inherent in that system	
d)	The condition which safeguards persons, tools, equipment, and plant when working near the electrical system	

<b>Question 37</b>		
Ofgem set price controls on the revenues of Transmission and Distribution Companies using the RIIO model to encourage Companies to consider a number of factors.		
What factors do the initials RIIO stand for?		
<b>Possible answers</b>		<b>Answer</b>
a)	Revenue = Ideas + Implementation + Outlay	
b)	Reward = Input + Investment + Outlay	
c)	Reward = Innovation + Ideas + Outputs	
d)	Revenue = Incentives + Innovation + Outputs	

<b>Question 38</b>		
The Electricity Safety, Quality and Continuity Regulations 2002 (ESQCR) place duties on persons to report certain instances.		
Which ONE of the following is reportable under ESQCR?		
<b>Possible answers</b>		<b>Answer</b>
a)	More interruptions to the electricity supply	
b)	Major interruptions to the electricity supply	
c)	All interruptions to the electricity supply	
d)	All planned interruptions to the electricity supply	

<b>Question 39</b>		
The Construction Design and Management Regulations 2015 (CDM) place certain responsibilities on duty holders involved in the work project to improve health and safety.		
Which ONE of following states an aim of the CDM regulations?		
<b>Possible answers</b>		<b>Answer</b>
a)	To appropriately cost the work so the tasks involved are managed to achieve financial success	
b)	To carefully plan the work so the risks involved are kept to a minimum and recorded for audit purposes	
c)	To plan the work to ensure the project is delivered within the set timescales	
d)	To sensibly plan the work so the risks involved are managed from start to finish	

<b>Question 40</b>		
The regulator Ofgem set targets for the Energy Network Companies.		
Which ONE of the following identifies three of the targets?		
<b>Possible answers</b>		<b>Answer</b>
a)	Consumer value, economical network design and good waste disposal	
b)	Customer service, network reliability and environmental performance	
c)	Customer communication, network performance and cost reduction	
d)	Consumer interaction, network monitoring and reduced wastage	

## End of Practice Assessment Questions

## Answers

<b>Question</b>	<b>Answer</b>	<b>Question</b>	<b>Answer</b>
<b>1</b>	B	<b>21</b>	D
<b>2</b>	D	<b>22</b>	B
<b>3</b>	A	<b>23</b>	C
<b>4</b>	C	<b>24</b>	D
<b>5</b>	A	<b>25</b>	B
<b>6</b>	A	<b>26</b>	C
<b>7</b>	D	<b>27</b>	A
<b>8</b>	C	<b>28</b>	C
<b>9</b>	B	<b>29</b>	C
<b>10</b>	A	<b>30</b>	B
<b>11</b>	A	<b>31</b>	B
<b>12</b>	A	<b>32</b>	B
<b>13</b>	D	<b>33</b>	B
<b>14</b>	C	<b>34</b>	A
<b>15</b>	B	<b>35</b>	D
<b>16</b>	D	<b>36</b>	C
<b>17</b>	B	<b>37</b>	D
<b>18</b>	A	<b>38</b>	B
<b>19</b>	B	<b>39</b>	D
<b>20</b>	C	<b>40</b>	B