



## 8202-520 JUNE 2018

### Level 2 Technical Certificate in Electrical Installation

#### Level 2 Electrical Installation – Theory exam

**Thursday 28 June 2018**  
**09:30 – 11:30**

Please note: Due to Question 5 being excluded from the original Jun 18 paper, this question has been replaced in this document. Question 59 has also been reworded from the original paper.

**You should have the following for this examination**

- a multiple-choice answer sheet
- a pen with black or blue ink
- non-programmable calculator

**Permitted reference material:**

BS 7671 (2015)  
IET On-site Guide

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**This question paper is the property of the City and Guilds of London Institute and is to be returned after the examination.**

#### Read the following notes before you answer any questions

- You **must** use a pen with black or blue ink to complete **all** parts of the answer sheet.
- Check that you have the correct answer sheet for the examination.
- Check that your name and candidate details are printed correctly at the top of your answer sheet.
- Inform the invigilator if your name or examination details are not correct.
- Each question shows **four** possible answers (lettered 'a', 'b', 'c' and 'd'); only **one** is correct.
- Decide which **one** is correct and mark your answer on the **answer sheet** with your pen.

For example if you decide 'a' is correct, mark your answer like this

101	<input checked="" type="radio"/>	<input type="radio"/> b	<input type="radio"/> c	<input type="radio"/> d
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

If you want to change your answer, cancel your first choice by filling in the 'cancel' box below the circle like this

101	<input checked="" type="radio"/>	<input type="radio"/> b	<input type="radio"/> c	<input type="radio"/> d
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Then mark the answer which you have now decided is correct. For example if you now decide 'c' is correct, mark your answer like this

101	<input checked="" type="radio"/>	<input type="radio"/> b	<input checked="" type="radio"/>	<input type="radio"/> d
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Any other marks on the form may invalidate some of your answers.

- Any calculations or rough working can be done on the question paper.
- Attempt all questions. If you find a question difficult, leave it and return to it later.

**This paper contains 60 questions. Answer them using the 'boxes' numbered 1 to 60 on the answer sheet.**

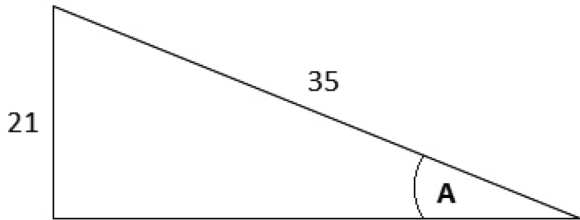
- 1 What is an organisational responsibility with regards to PPE?
- Must be worn at all times.
  - Any defects must be reported.
  - Training and information on its use must be provided.
  - Must be used in accordance with any training provided.



Figure 1

- 2 What regulation does the symbol, in Figure 1, apply to?
- WEEE.
  - EAWR.
  - Control of Noise Regulations.
  - The Pollution Prevention and Control Act.
- 3 What document sets out a systematic approach for a set task?
- Permit to work.
  - Method statement.
  - Risk assessment.
  - Job sheet.
- 4 What is the immediate action that **must** be taken upon discovering a colleague being exposed to an electric shock?
- Pull the casualty away.
  - Call for medical assistance.
  - Switch off the main supply.
  - Assess the situation.

- 5 Which personnel is concerned with the design and physical integrity of buildings and other large structures?
- Site Manager.
  - Safety Officer.
  - Structural Engineer.
  - Site Supervisor.
- 6 What job role entails checking the quality of materials and installation meets the client's requirements?
- Clerk of Works.
  - Project Manager.
  - Contracts Manager.
  - Quantity Surveyor.
- 7 What value is required to determine circuit power where only the circuit resistance is known?
- $I^2$
  - $Z_s$
  - $E$
  - $L$
- 8 What value represents 1 M $\Omega$ ?
- $1 \times 10^{-6} \Omega$
  - $1 \times 10^{-3} \Omega$
  - $1 \times 10^3 \Omega$
  - $1 \times 10^6 \Omega$
- 9 According to Ohms Law, which is the correct formula?
- $R = V \times I$
  - $R = \sqrt{V^2 + I}$
  - $R = I / V$
  - $R = V / I$
- 10 What is the sum of all the angles in a right angle triangle?
- 60.
  - 90.
  - 180.
  - 360.



**Figure 2**

11 What is the value of angle A shown in Figure 2?

- a 30.96
- b 36.87
- c 50.31
- d 53.13

12 What part of the atom is negatively charged?

- a Proton.
- b Nucleus.
- c Electron.
- d Neutron.

13 What material is used as an insulator?

- a Tungsten.
- b Porcelain.
- c Mercury.
- d Carbon.

14 Which insulator is Hygroscopic?

- a Mica.
- b Bakelite.
- c Polyvinyl chloride.
- d Magnesium oxide.

15 How much power is dissipated by a 25 Ω resistor when 4 A flows through it?

- a 0.4 W
- b 40 W
- c 0.4 kW
- d 40 kW

16 What calculation would be used to calculate total resistance in a series circuit?

- a  $R_1 + R_2 + R_3$
- b  $\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$
- c  $\frac{1}{R_1} \times \frac{1}{R_2} \times \frac{1}{R_3}$
- d  $R_1 \times R_2 \times R_3$

17 What is the length of a 2.5 mm<sup>2</sup> copper conductor having a resistance of 0.207 Ω at 20 °C?

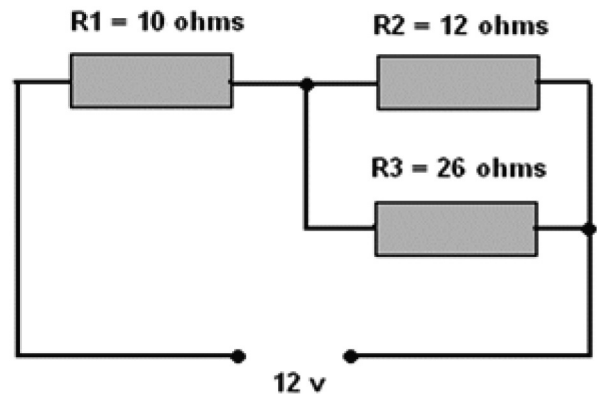
The resistivity of copper is 0.0172 μΩ/m.

- a 20 m
- b 30 m
- c 40 m
- d 50 m

18 Three resistors of 12 Ω, 6 Ω and 4 Ω are connected in parallel.

What is the total circuit resistance?

- a 0.5 Ω
- b 2 Ω
- c 22 Ω
- d 288 Ω



**Figure 3**

19 What is the total current for the circuit in Figure 3?

- a 3.83 A
- b 1.51 A
- c 0.66 A
- d 0.25 A

- 20 What two values does a wattmeter measure?
- Voltage and resistance.
  - Capacitance and resistance.
  - Voltage and current.
  - Current and capacitance.
- 21 What is the unit of measure for magnetic flux?
- Weber.
  - Henrys.
  - Kelvin.
  - Hertz.
- 22 What is the flux density when a conductor of effective length 0.25 m is moving at right angles through a magnetic field at a velocity of 5 m/s and is generating 1.375 V?
- 1.1 T
  - 2.1 T
  - 3.375 T
  - 6.625 T
- 23 What is the output voltage of a transformer that is rated at 150 kVA and delivers 375 A at full load?
- 56 kV
  - 525 V
  - 400 V
  - 225 V
- 24 How many primary turns will a 200 kVA, 3.3 kV/240 V 50 Hz single-phase transformer have, when there are 80 turns on the secondary winding?
- 1100 turns.
  - 833 turns.
  - 60 turns.
  - 3 turns.
- 25 What is Fleming's formula for calculating force?
- $F = B + I + L$
  - $F = \frac{B}{I - L}$
  - $F = \frac{B}{I \times L}$
  - $F = B \times I \times L$
- 26 What is the unit of measurement for inductance?
- Ohms.
  - Henrys.
  - Farads.
  - Siemens.
- 27 What is the operating principle of a double-wound transformer?
- Self-induction.
  - Shared-induction.
  - Mutual induction.
  - Opposed induction.
- 28 What is the RMS voltage of a sine wave having a peak value of 90 V?
- 127.3 V
  - 102.69 V
  - 78.89 V
  - 63.63 V
- 29 What passive component is used to reduce current in an electronic circuit?
- Resistor.
  - Thyristor.
  - Transistor.
  - Amplifier.



**Figure 4**

- 30 What **must** be performed before using the equipment shown in Figure 4, on site?
- Earth leakage test.
  - GS 38 checks.
  - User checks.
  - Earth bond test.

31 What is the **minimum** distance required, from the top of a floor joist, for a hole used to pass cables through?

- a 50 mm
- b 60 mm
- c 70 mm
- d 80 mm

32 What is the **most** suitable cable for a fire alarm sounder installation?

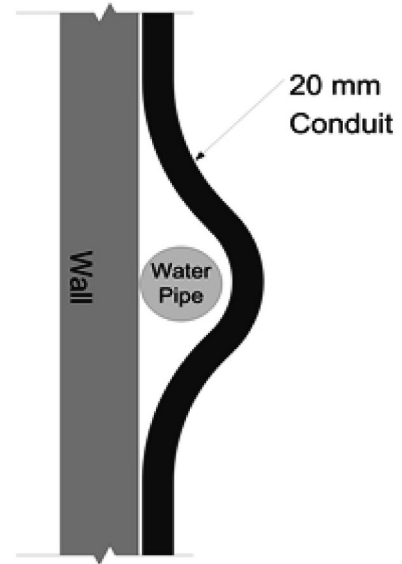
- a Cat 5.
- b Fibre optic.
- c Cat 6.
- d MIMS.



**Figure 5**

33 What is the item shown in Figure 5 used for?

- a Drawing in.
- b Dressing in.
- c Filling in.
- d Forming in.



**Figure 6**

34 What type of conduit set is shown in Figure 6?

- a Double set.
- b Bubble set.
- c 180 bend.
- d Kick.



**Figure 7**

35 What type of cable would be supported by the item shown in Figure 7?

- a PVC SWA.
- b MICC.
- c SY Flex.
- d Twin and cpc.

- 36 What is the **minimum** height that cables must be installed at, on a catenary system above a walkway?
- 2.5 m
  - 3 m
  - 3.5 m
  - 4 m
- 37 What External Influence within BS 7671 would affect the selection of a containment system?
- Capacity.
  - Utilisation.
  - Suitability.
  - Affordability.
- 38 What support system would be **most** suitable for running a large SWA up a building electrical riser?
- Trunking.
  - Basket.
  - Ladder.
  - Conduit.
- 39 What factor will affect the **minimum** permissible csa of a cable?
- Cost.
  - Load.
  - Aesthetics.
  - Practicality.
- 40 What is the nominal voltage (AC) indicated by a red BS EN 60309 socket?
- 400 V
  - 230 V
  - 110 V
  - 50 V
- 41 What termination method is used to connect a conductor to a large busbar system?
- Solder.
  - Crimp.
  - Welded.
  - Brazed.
- 42 What is a transmission voltage?
- 11 kV
  - 25 kV
  - 33 kV
  - 400 kV
- 43 Who is responsible for the electrical meter in a domestic installation?
- The owner.
  - The electrician.
  - The energy supplier.
  - The occupant.
- 44 What device provides Additional Protection against electric shock?
- RCD.
  - MCB.
  - BS 88 Fuse.
  - BS 3036 Fuse.
- 45 Which supply system uses a Protective Earth and Neutral conductor?
- TT
  - TN-S
  - IT
  - TN-C-S
- 46 Which supply system would have a  $R_A$  value?
- TT
  - TN-S
  - TN-C
  - TN-C-S
- 47 Which protective device requires a rating factor of 0.725?
- BS 88-3
  - BS 3036
  - BS 1362
  - BS 88-2
- 48 Which of the following is a Protective Measure against faults as given in BS 7671?
- ADS.
  - Barriers.
  - RCD.
  - Insulation.
- 49 Which of the following **must** be Earthed?
- Metallic service pipe.
  - Metallic luminaire.
  - Steel air ducting.
  - Structural steel.

50 What is the purpose of Basic Protection?

- a To protect cables.
- b To protect equipment.
- c To prevent electric shock.
- d To prevent damage to installation.

51 Why are Earthing conductors installed?

- a To connect together exposed and extraneous conductive parts.
- b To provide a link between all extraneous conductive parts.
- c To achieve basic protection.
- d To achieve fault protection.

52 What accessible parts would require a Protective Bonding Conductor connection?

- a Steel structural beams.
- b Metallic conduit system.
- c Steel trunking system.
- d Metallic cable tray.

53 A circuit supplying a 13 A load is wired using a cable having a stated voltage drop of 11 mV/A/m and a length of 32 m. What would be the voltage drop for this circuit?

- a 0.45 V
- b 3.52 V
- c 4.58 V
- d 9.15 V

54 What does Part M of the Building Regulations give guidance on?

- a Heights of socket-outlets.
- b Fire compartments in buildings.
- c Energy efficiency of lighting circuits.
- d Depths of cables chases in walls.

55 What type of drawing is commonly used to show the positioning of electrical equipment?

- a Circuit.
- b Layout.
- c Wiring.
- d Schematic.

Questions 56 to 60 refer to the following scenario.

A new single-phase electrical installation within an office is to be wired using PVC/PVC insulated and sheathed flat profile 70 °C thermoplastic cable. Data cables are to be installed by a subcontractor using the same containment systems, and the  $Z_e$  value for this installation is 0.35  $\Omega$ .

The cables are to be installed using a mixture of surface, PVC conduit, metallic cable tray and PVC two-compartment dado trunking. The schedule for the final circuits is shown in the table below.

The installation supply is to be supported via a solar photovoltaic system to be installed on the flat roof of the building which is 6 m from ground level.

No	Designation	Live mm <sup>2</sup>	CPC mm <sup>2</sup>	Type of Protective Device	Circuit Length	Conductor Material
1	Radial power	2.5	1.5	BS EN 61009	15 m	Copper
2	Radial power	2.5	1.5	BS EN 61009	25 m	Copper
3	Ring final circuit	2.5	1.5	BS EN 61009	25 m	Copper
4	Ring final circuit	2.5	1.5	BS EN 61009	10 m	Copper
5	2 kW Space heater	2.5	1.5	BS EN 61009	20 m	Copper
6	2 kW Water heater	2.5	1.5	BS EN 61009	15 m	Copper
7	6 x 100 W luminaires	1.5	1.5	BS EN 61009	35 m	Copper
8	6 x 100 W luminaires	1.5	1.5	BS EN 61009	25 m	Copper

**Table 1**

56 Why is compartmental trunking utilised within this installation?

- a To keep different coloured cables apart.
- b To separate Band I and Band II circuits.
- c To separate cables to reduce eddy currents.
- d To keep lighting and power circuits apart.

57 When a ladder is only anchored at ground level, what is the required **minimum** length to enable the inspection of the solar photovoltaic panels?

- a 6.2 m
- b 7.2 m
- c 8.2 m
- d 9.2 m

- 58 Which part of the RCBO operates under overload conditions?
- a Residual current trip.
  - b Electro-magnetic trip.
  - c Chemical trip.
  - d Thermal trip.
- 59 What is the  $Z_s$  value for circuit 5, shown in Table 1, if the installation conditions result in the conductors operating at their maximum operating temperature?
- a  $0.39 \Omega$
  - b  $0.68 \Omega$
  - c  $0.74 \Omega$
  - d  $0.82 \Omega$
- 60 Why does BS 7671 recommend neutrals to be installed at light switches?
- a To facilitate electronic switching devices.
  - b To ensure short circuits are avoided.
  - c To enable lights to be fully isolated.
  - d To provide emergency lighting test facilities.

**NOW GO BACK AND CHECK YOUR WORK**

- IMPORTANT -  
Are the details at the top of the answer sheet correct?  
Have you filled in your answers in INK in the appropriate boxes on the answer sheet?