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8202-520 JUNE 2022
Level 2 Technical Certificate in Electrical Installation
Level 2 Electrical Installation – Theory exam

Monday 20 June 2022
09:30 – 11:30

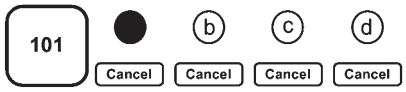
You should have the following for this examination
- a multiple-choice answer sheet
- a pen with black or blue ink
- a non-programmable calculator

Permitted reference materials:
BS 7671
IET On-Site Guide

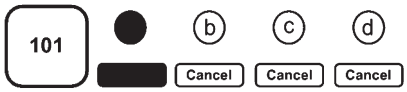
This question paper is the property of the City and Guilds of London Institute and is to be returned after the examination.

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.

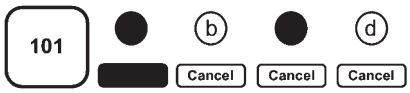
For example if you decide 'a' is correct, mark your answer like this



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



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



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.

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1 What is the **first** action to take after discovering an accidental fire on a construction site?

a Ring the HSE.
b Raise the alarm.
c Smother the flames.
d Find an extinguisher.

2 Which instrument is required to carry out Safe Isolation?

a Loop Impedance Tester.
b Low Resistance Ohmmeter.
c Approved Voltage Indicator.
d Insulation Resistance Tester.

3 Which substance would require specialist licenced removal if found during a building demolition?

a Cement.
b Gypsum.
c Plywood.
d Asbestos.

4 What is the **maximum** voltage to earth of a single-phase reduced low voltage supply used on a construction site?

a 55 V
b 110 V
c 230 V
d 400 V

5 Who is responsible for working out estimates for materials using a building design?

a Client.
b Architect.
c Clerk of works.
d Quantity surveyor.

6 What unit is equivalent to V x 10^{-3}?

a MV
b kV
c mV
d µV

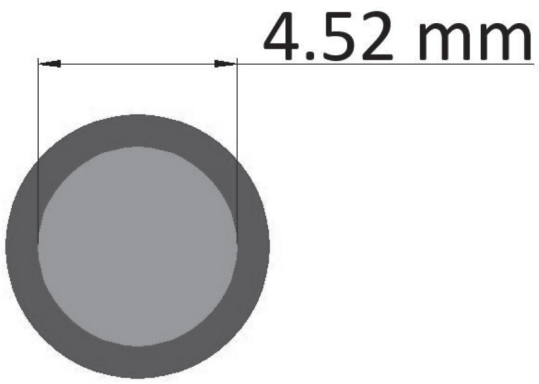

Figure 1

7 What is the cross-sectional area for the conductor shown in **Figure 1**?

a 6 mm^2
b 10 mm^2
c 16 mm^2
d 25 mm^2

8 Transpose $I_b = \frac{P}{\sqrt{3} \times V_L \times Cos\phi}$ to make V_L the subject.

a $V_L = \frac{P}{\sqrt{3} \times Cos\phi \times I_b}$

b $V_L = \frac{\sqrt{3} \times Cos\phi \times I_b}{P}$

c $V_L = \frac{\sqrt{3} \times Cos\phi \times P}{I_b}$

d $V_L = \frac{I_b}{\sqrt{3} \times Cos\phi \times P}$

9 Which is a formula for calculating power?

a $P = IR^2$
b $P = I^2R$
c $P = VR^2$
d $P = I^2V$

10 A hot water cylinder is 1.4 m high and 0.45 m in diameter.

What is the **maximum** volume of water this cylinder can hold?

a 0.11 m^3
b 0.22 m^3
c 0.44 m^3
d 0.89 m^3

11 Which has the lowest resistivity?

a Lead.
b Steel.
c Copper.
d Aluminium.

12 Which electrical insulation material absorbs moisture if left exposed to the atmosphere?

a Butyl rubber.
b Polyvinyl chloride.
c Magnesium oxide.
d Linked polyethylene.

Image: https://www.hobut.co.uk/

Figure 2

13 What would the instrument shown in **Figure 2** be used to display the value of?

a Current.
b Voltage.
c Wattage.
d Resistance.

14 What would be the nominal voltage of a battery made up of twenty-five 1.2 V cells when connected in series?

a 1.2 V
b 12 V
c 30 V
d 48 V

15 Which formula is correct?

a $I = \frac{V}{R}$

b $R = \frac{I}{V}$

c $V = \frac{I}{R}$

d $V = \frac{R}{I}$

16 Which type of cable would be **most** suitable for a circuit which **must** operate in fire conditions?

a MICC
b PILCS
c PVC SWA
d XLPE SWA

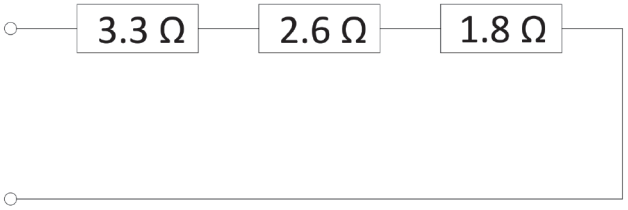

Figure 3

17 What is the total resistance of the circuit shown in **Figure 3**?

a 0.8 Ω
b 1.24 Ω
c 2.6 Ω
d 7.7 Ω

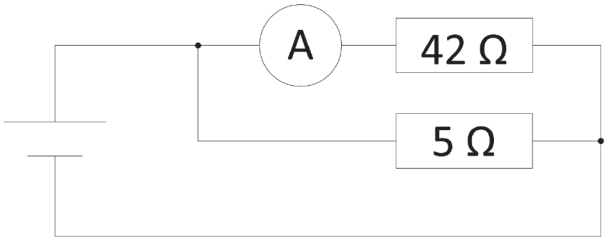

Figure 4

18 What is the total current in the circuit shown in **Figure 4** if the ammeter reads 8 Amps?

a 7.1 A
b 16.0 A
c 67.2 A
d 75.2 A

19 What does the second finger represent in Fleming's Right Hand Rule?

a Field.
b Motion.
c Current.
d Resistance.

See next page

Figure 5

20 **Figure 5** shows three magnets.
What magnetic effects would be expected?

a 'A' will repel 'B' 'B' will repel 'C'.
b 'A' will attract 'B' 'B' will repel 'C'.
c 'A' will repel 'B' 'B' will attract 'C'
d 'A' will attract 'B' 'B' will attract 'C'.

21 What force would be created by a current of 16.2 A flowing through 4800 mm of conductor with a flux density of 0.23 T?

a 17.88 N
b 68.15 N
c 338.09 N
d 17884.80 N

22 What is the formula used to calculate the RMS voltage on a 50 Hz sine wave?

a $V = \frac{Peak}{\sqrt{2}}$

b $V = \frac{Peak}{2}$

c $V = Peak \times 2$

d $V = Peak \times \sqrt{2}$

23 A transformer has 495 primary and 18 secondary turns and has a secondary voltage of 400 V.

What value is the input voltage?

a 1100 V
b 3300 V
c 11000 V
d 33000 V

24 What is the principle used by a current transformer?

a Induction.
b Radiation.
c Capacitance.
d Conductance.

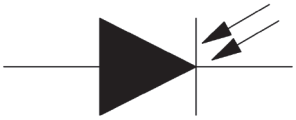

Figure 6

25 Which component is represented by the symbol in **Figure 6**?

a LED.
b LDR.
c Photo diode.
d Zenner diode.

26 Which component is used to directly amplify a signal within a piece of electronic equipment?

a Resistor.
b Thyristor.
c Transistor.
d Capacitor.

Figure 7

27 What is the intended purpose of the tool shown in **Figure 7**?

a Cable cutting.
b Gripping fixings.
c Crimp terminations.
d Tighten connections.

28 A straight 2 m length of conduit is to be installed to house 18 stranded 2.5 mm^2 PVC insulated copper conductors.

What is the **minimum** conduit factor required?

a 558
b 702
c 774
d 1044

29 What type of containment could include a running-coupler?

a Tray.
b Ladder.
c Conduit.
d Trunking.

30 What type of circuit is **most** likely to include insulation displacement connectors?

a 230 V ring final.
b HV transmission.
c 11,000 V distribution.
d ELV telecommunication.

Figure 8

31 Which type of cable is the clip shown in **Figure 8** intended to support?

a PILC.
b SWA.
c MICC.
d CAT 5.

32 Which tool would be **most** suitable to cut a hole in a section of trunking to accept a 20 mm conduit coupler and bush?

a Pad saw.
b Hole saw.
c Hack saw.
d Panel saw.

33 What is the **minimum** height that a socket-outlet can be mounted from the finished floor level of a new domestic premises, to comply with Building Regulations?

a 350 mm
b 400 mm
c 450 mm
d 500 mm

34 What is the **minimum** internal bend radius for a multicore stranded copper non-armoured cable with a diameter of 15 mm?

a 75 mm
b 60 mm
c 45 mm
d 30 mm

Image: https://www.toolstation.com/

Figure 9

35 What type of fixing is shown in **Figure 9**?

a Tie.
b Cleat.
c Saddle.
d Crampet.

36 What is the **minimum** degree of protection for the accessible top horizontal surface of a consumer unit?

a IP2X
b IP3X
c IP4X
d IP5X

37 Which type of circuit would **most** likely use CAT 5 cable?

a Socket-outlet.
b Outside lighting.
c Domestic cooker.
d Computer ethernet.

38 What is the **maximum** permissible distance between supports on an accessible metal trunking system with a cross-sectional area of 400 mm^2 installed horizontally?

a 0.75 m
b 1.25 m
c 1.00 m
d 1.50 m

See next page

39 Which substance reacts with PVC if installed in contact with one another?

a Polypropylene.
b Nylon polymer.
c Expanded polystyrene.
d Cross-linked polyethylene.

40 Which method of electricity generation is classed as renewable energy?

a Wind.
b Coal.
c Gas.
d Oil.

41 What is the **maximum** typically quoted external earth fault loop impedance value, for a 100 A domestic electrical installation, forming a TN-S system?

a 0.20 Ω
b 0.35 Ω
c 0.55 Ω
d 0.80 Ω

42 Which system relies on the general mass of earth as a conductor between the installation earth electrode and supply earth electrode?

a TT
b TN-C
c TN-S
d TN-C-S

43 Which is used to support high voltage transmission bare conductors in the UK distribution network?

a Pylons.
b Ladders.
c Platforms.
d Catenaries.

44 Who is responsible for the meter tails between a utility electricity meter and CU?

a Supplier.
b Consumer.
c Licencing authority.
d Network operator.

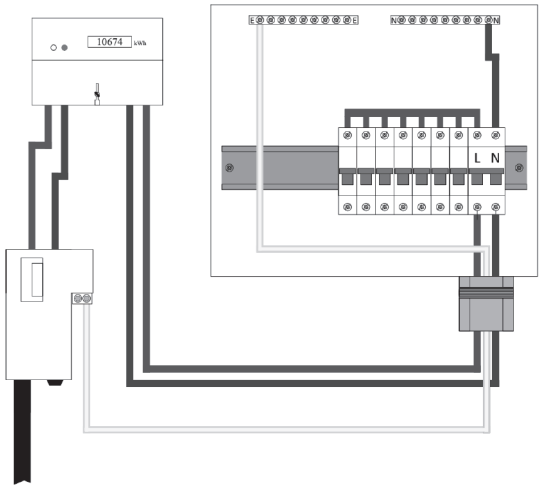

Figure 10

45 Which earthing system is shown in **Figure 10**?

a IT
b TT
c TN-S
d TN-C-S

46 Which is the operating principle of an RCD in a single-phase consumer unit?

a Measures overload current.
b Heats up a bi-metallic strip.
c Measures the earth fault current.
d Detects imbalance between L and N.

Figure 11

47 A new protective device, as shown in **Figure 11**, is to be fitted within an existing consumer unit.

What is the British Standard this device **must** conform to?

a BS EN 60898
b BS EN 61009
c BS EN 60309
d BS EN 60947

48 Which is an exposed-conductive-part?

a Metallic water pipe.
b Galvanized trunking.
c Gas installation pipe.
d Structural steel girder.

49 Which is a method of providing Basic Protection as prescribed in BS 7671?

a Installation of an RCD.
b Insulation of live parts.
c Equipotential bonding.
d Earthing of exposed parts.

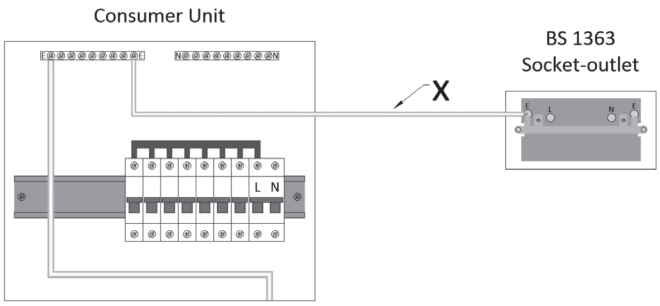

Figure 12

50 Which conductor is labelled X in **Figure 12**?

a Earthing conductor.
b Circuit protective conductor.
c Supplementary bonding conductor.
d Main protective bonding conductor.

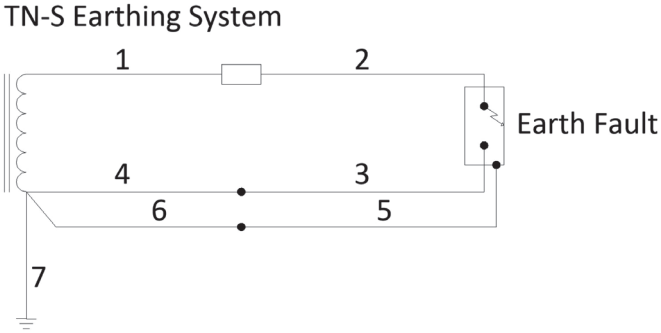

Figure 13

51 Which conductors shown in **Figure 13** would carry the earth fault current?

a 1, 2 and 7
b 2, 3 and 4
c 1, 5 and 6
d 2, 5 and 7

52 What is the **maximum** disconnection time for a 230 V final circuit within a TN-S installation protected by a 20 A BS EN 60898 circuit breaker as prescribed in BS 7671?

a 0.2 s
b 0.4 s
c 1 s
d 5 s

53 What is the symbol for the line conductor of a radial circuit?

a r_1
b r_2
c R_1
d R_2

54 Conductors are being selected for a domestic premises which is supplied via a 100 A supplier cut-out fuse. The installation forms part of a TN-C-S system.

What is the **minimum** cross-sectional area for main protective bonding conductors within this installation?

a 4 mm^2
b 6 mm^2
c 10 mm^2
d 16 mm^2

55 What is the design current for a 230 V electric shower rated at 9.5 kW?

a 4.1 A
b 24.2 A
c 39.6 A
d 41.3 A

56 Which publication contains a table giving percentages to be used when applying diversity to installation design current figures?

a Guidance Note 3.
b IET On-Site Guide.
c Approved Document P.
d BS 7671 Wiring Regulations.

See next page

57 Which information **must** be supplied to the client on handover of an electrical installation in a domestic premises?

a Materials used list.
b Product user instructions.
c Electrical personnel register.
d Manufacturers' installation instructions.

58 A 6 mm^2 70 °C PVC thermoplastic flat cable is to be installed in trunking within a factory.

What is the **maximum** current-carrying capacity for this cable?

a 27 A
b 32 A
c 38 A
d 52 A

59 What is the **maximum** current-carrying capacity for a 2.5 mm^2 flat profile 70 °C thermoplastic cable installed in an ambient temperature of 35 °C installed as method C?

a 19.74 A
b 23.49 A
c 25.38 A
d 28.72 A

60 A 19 m circuit is to be installed to supply a load of 14 A, using 70 °C thermoplastic flat profile cable with protective conductor.

What would the voltage drop for this circuit be if installed using 1.5 mm^2 live conductors?

a 6.9 V
b 7.7 V
c 11.5 V
d 11.7 V

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?