

## EDA Product Knowledge Programme

### Answers for the Exemplar End of Module Assessment Nov 2018

#### Multiple Choice Answers

- 1- B
- 2- A
- 3- D
- 4- C
- 5- C
- 6- C
- 7- C
- 8- A
- 9- A
- 10- A

#### Example Short Questions

##### Question 1.

- a) Briefly describe the main features of indirect lighting, and
- b) Give 3 examples of where indirect lighting might be used.

##### Answer

##### Features

The light emissions from an indirect luminaire are redirected from another surface, such as the ceiling or wall, before the effects of the light are noticed.

½ Mark

This form of lighting can be described as 'diffused' (i.e. goes in various directions/not concentrated in one place) and there is very little glare from the light source.

½ Mark

The resulting levels of light, measured in lux, are usually lower than direct lighting. This is because it relies on the reflective qualities of other surfaces, such as a ceiling.

½ Mark

If walls are painted with dark colours, or have become dirty, the surfaces are not as reflective and the lighting performance is poorer. Dirty ceiling tiles will also have an effect.

½ Mark

There is much less glare from this type of lighting design. It can also provide softer, more atmospheric 'mood' lighting that may work particularly well in restaurants or in living rooms. Indirect lighting can also be used to enhance the outline of architectural features such as columns or windows.

½ Mark

The reliance on reflection from other surfaces means that indirect lighting can be an inefficient solution for areas that need higher lighting levels for tasks – e.g. reading a book will be difficult if the environment is lit with indirect lighting.

1 Mark

Examples of common use:

- highlighting architecture and reception desks inside a hotel concourse;
- enhancing ceilings as an uplighter; or
- detailing features within homes.

½ Mark
--------

½ Mark
--------

½ Mark
--------

**Question 2**

Briefly describe the environmental features of a luminaire with the following IP Ratings, giving an example of how each luminaire might be used.

IP20

IP44

IP65

IP66

IP68

Answer

**IP20**

Most interior luminaires that are installed in relatively safe environments, like office ceilings, will only need relatively low protection against the insertion of objects or dust (so the first digit is '2') and no protection against water ingress (so the second digit is '0'). The two digits combine to become IP20.

1 Mark

**IP44**

In certain locations, usually indoors, where moisture content might be high, IP44 maybe specified. An example might be zone 2 of a bathroom or shower room. This IP rating means that the luminaires have a reasonable amount of protection against the insertion of objects or infiltration by dust and a certain degree of sealing against moisture. Luminaires rated at IP44 might be used outdoors where they might also be protected from direct contact from the elements in other ways, for example, by a porch, carport or bus shelter.

1 Mark

**IP65**

This rating offers full protection against the ingress of dust (so the first digit is '6'). Externally, an IP65 luminaire might be specified if the requirement is for a water-resistant light fitting, so splashes would be okay. However, it is not fully waterproof so the luminaire shouldn't be submerged.

1 Mark

**IP66**

IP66 might be specified where there is the need for a waterproof fitting, so some exposure to rain would be okay. However, like the IP65 luminaire, it should also not be submerged.

1 Mark

**IP68**

IP68 allows a waterproof fitting that can be permanently submerged at depths of up to 4 m. This is the highest rating typically available and could be used in areas like swimming pools etc.

1 Mark

**Question 3**

With regards to electrical safety, briefly describe the design features we might use to prevent electric shock

**Answer****Basic protection (protection against direct contact)**

Basic protection helps stop people (and animals) coming into contact with live conductors that operate at hazardous voltages

1 Mark

**Limiting voltage**

It is possible for the voltage – the EMF that pushes electrons around a circuit – to be so low that touching it will not push electricity through the body. The voltage that is safe depends on whether a person is wet or dry. In bathrooms, the safe voltage is considered to be AC 24 V or DC 30 V. Household batteries are a good example of limiting the voltage for safety. That is why they are often used in children's toys.

2 Marks

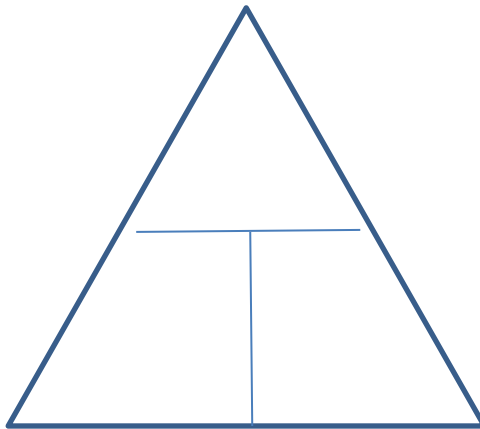
**Placing out of reach**

With this method, conductors are placed so that they are impossible to touch. This method of protection is used with overhead electric wires, such as electric pylons. They are so high no one can touch them

2 Marks

**Question 4**

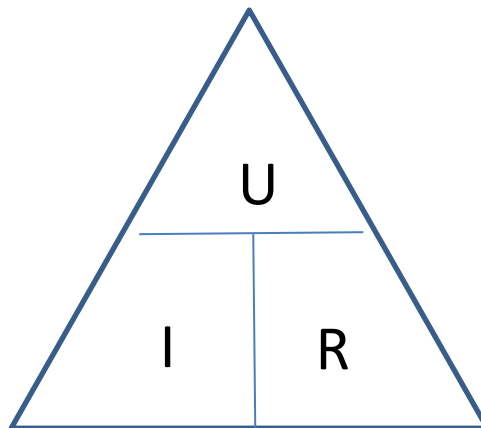
1) Complete the following Ohms Law Triangle:



2) Complete the table below, giving examples of typical calculations:




**Answer**

1)



2 Marks

2)

To find	Step 1: Cover what you don't know	Step 2: Do what you see	Example
Voltage $U$ when you know current $I$ and resistance $R$	Cover $U$ 	Multiply $I$ and $R$ $U = I \times R$	$R = 100 \Omega$ $I = 2.3 \text{ A}$ $U = 23 \times 100$ so, $U = 230 \text{ V}$
Current $I$ when you know voltage $U$ and resistance $R$	Cover $I$ 	Divide $U$ by $R$ $I = \frac{U}{R}$	$UV = 12 \text{ V}$ $R = 12 \Omega$ $I = \frac{12}{12}$ so, $I = 1 \text{ A}$
Resistance $R$ when you know voltage $U$ and current $I$	Cover $R$ 	Divide $U$ by $I$ $R = \frac{U}{I}$	$U = 230 \text{ V}$ $I = 0.5 \text{ A}$ $R = \frac{230}{0.5}$ $R = 230/0.5$ so, $R = 460 \Omega$

1 Mark

1 Mark

1 Mark







Total of 3 Marks

Or any other appropriate calculation using correct symbols and formulae giving correct answers

**Question 5**

In the table below insert the "Volts and Phase" and the "Uses" description for each blank space

Answer

Colour	Keyway clock position	Voltage and phase	Uses	View looking into socket
Yellow	4h	110V single phase	Construction site general use single-phase supplies	
Blue	6h	230V single phase	Caravan and motor caravan supplies Mobile and transportable units Commercial and industrial equipment Marinas	
Blue	9h	200V three-phase delta (no neutral)	Special three-phase equipment	
Blue	9h	200V three-phase star (three-phase plus neutral)	Special three-phase equipment	
Red	6h	400V three-phase delta (no neutral)	Commercial and industrial equipment	
Red	6h	400V three-phase star (three-phase plus neutral)	Commercial and industrial equipment Larger mobile and transportable units	

## Example Long Questions

### Long Question 1 (Introduction to the Principles of Electricity)

With regards to Electrical Safety Legislation:

- a) Explain why we have legislation for Electrical Safety? (2 Marks)
- b) Briefly describe the purpose and objectives of the following regulations
  - I. Electrical safety, Quality and Continuity Regulations 2002 (2 Marks)
  - II. Electrical Equipment (Safety) Regulations 2016 (2 Marks)
  - III. Plugs and Sockets etc. (Safety) Regulations 1994 (2 Marks)
  - IV. Electricity at Work Regulations 1989 V (2 Marks)
  - V. The Provision and Use of Work Equipment Regulations 1998 (PUWER) (2 Marks)
  - VI. Construction Products Regulations 2013 (2 Marks)
- c) List 2 other pieces of Legislation that exist for electrical equipment (1 mark in total)

Answer

a)

As we have seen in this section, electricity can be dangerous – it can cause electric shock, fire and explosions if it is not properly controlled.

Legislation is in place to make sure that those responsible for the supply of electricity and electrical products, the design of electrical installations and the management of places of work, control and handle electricity appropriately.

#### 2 Marks

b)

- I. The Electrical Equipment (Safety) Regulations 2016 require that manufacturers of products meet a minimum level of safety and, where appropriate, adopt relevant safety standards for the design, manufacture and testing of the products.
- II. Manufacturers will make a suitable statement that the provisions of the legislation have been met, and will apply a 'CE mark' to tell consumers that this has been done.
- III. The Plugs and Sockets etc. (Safety) Regulations 1994 require most products to be fitted with a suitable UK plug and an appropriately rated fuse, to make sure they are safe to use in the UK. The legislation also has requirements for the safety of plugs themselves, requiring plugs to display an appropriate safety approval marking from a relevant body.



- IV. The Electricity at Work Regulations 1989 include a number of recommendations to ensure people at work are not exposed to unnecessary risks relating to electrical safety. These include:
- (a) that employers are responsible for ensuring that electrical equipment and installations are properly maintained and continue to be safe;
  - (b) that those working on electrical equipment or installations to be competent (skilled/knowledgeable/confident) to prevent danger to themselves and others; and
  - (c) safe working practices are used for electrical work.
- V. The Provision and Use of Work Equipment Regulations 1998 (PUWER) reinforce the requirements to ensure that equipment at work (including electrical equipment) is:
- (a) Fit for the purpose that it will be used for at work; and
  - (b) Adequately maintained to ensure it remains safe.
- PUWER also contains requirements for employers to carry out risk assessments for the use of equipment in the workplace. Employers must also provide training and/or instructions for the safe use of equipment in the workplace.
- VI. The Construction Products Regulations 2013 requires products that are used in the construction of buildings (which may include the electrical installation) to comply with the relevant requirements for the product's specification and descriptions of its performance.

**2 Marks for each answer giving 12 marks in total**

c)

Any one from those shown below

- a. The Supply of Machinery (Safety) Regulations 2008 covers the safety of machinery, such as that used in factory processes;
- b. The Medical Devices Regulations 2002 covers the safety of devices (including electrical equipment) used for patient care, treatment, etc.

**1 mark for an answer from the 2 above**

**Long Question 2**

1

- A) Briefly describe what an Integrated Residual Current Device (RCD) is and describe how it works.
- B) Explain how you can easily recognise if a plug or socket has an RCD fitted.
- C) Some RCDs will not restore power until the user resets the device. Explain where this would be:
  - I. An advantage
  - II. A disadvantage

2

With reference to Integral USB Outlets

Briefly explain the points and features to look out for when supplying USB charging outlets.

Answer

1

- A. Instead of a simple switch, the socket-outlet may include a built-in safety protection device, called an RCD. The RCD measures the current in Line and Neutral and, if there is a difference, it assumes that the 'lost' current must have gone to earth because of a fault. RCDs measure very small currents – thousandths of an Ampere – and are usually set to trip at 30 mA because this is a general requirement for most socket-outlets in BS 7671. 4 Marks
- B. You will be able to see whether a plug or socket-outlet has an RCD fitted, because it will have a 'Test' button and either a trip-switch or 'Reset' button. 1 Mark
- C.
  - i. This can be very handy for portable appliances like power tools and lawnmowers. 1 Mark
  - ii. This could be disastrous if used on certain other appliances such as fridge-freezers

**7 Marks in Total**

2

The following should be noted as features and points to look out for when supplying USB charging outlets:

- a) the charging current of the USB outlet may be important to the device. If this is too low, devices may not charge fully, or they may take too long to charge. Some devices may require a charging currents of up to 3.1 A. Many outlets provide 2.1 A, but higher current capabilities are increasingly becoming available. 2 Marks

- b) the power output will generally be 5 V – but some devices require the full 5.1 V and where the charger can achieve this, they may specifically state '5.1 V' on the device and in the manufacturer's information. 2 Marks
- c) USB standards include a requirement for intelligent power management. USB chargers in some less expensive outlets may not limit power in accordance with the standards. This might cause problems with mobile devices not charging properly, or being damaged further if there is an electrical fault in the product. 2 Marks
- d) some outlets with integral USB chargers require a deeper backbox. If the backbox is too narrow, then wiring may become squashed or stretched as the outlet is fixed, and/or the electronics may overheat. It is important to check the manufacturer's recommendations for these types of outlets to ensure that the correct backbox is supplied. 2 Marks

**8 Marks in Total**