



5. (a) Show by means of a diagram what is an inspection fitting. What are the restrictions on the use of solid (non-inspection) elbows and tees? **(4 marks)**
- (b) Electricians treat the ends of conduit and end-up entries to boxes and accessories by a specific conduit fitting in order to prevent damage to cables. Explain how both the above are achieved when working with conduit in a domestic installation. **(4 marks)**
- (c) Comment on the advantages and disadvantages of conduit and trunking systems. What special precautions must be taken when using PVC conduit? **(12 marks)**
6. (a) When an electrical installation is finished a number of tests are carried out. List the sequence of tests required:
- (i) before the supply is connected **(5 marks)**
- (ii) with the supply connected **(4 marks)**
- (b) List four types of instruments that are commonly used to test electrical installations. **(4 marks)**
- (c) A single-bedroom flat, having a combined kitchen and a dining room, bathroom, living area and a small study room, is to be installed. As an electrician you are assigned to carry out the Electrical Installation work. Develop a general 'Bill of Quantities' for the above single-bedroom flat.
- Note:** You are not required to give exact quantities, just a general list. **(7 marks)**

Total: 100 marks

END OF EXAMINATION PAPER

Examination for Authorisation A

Paper 2: Electrical Installation Technology

Date: 5 February 2020

Time: 09:00 – 12:00 (Three hours)

This examination paper contains six questions. Candidates are requested to answer any FIVE (5) questions. Candidates are also requested to include all their work in the booklet provided. Every answer should include all workings, any necessary diagrams and formulae. Use a fresh page for each different question. Each question carries 20 marks.

1. (a) With the aid of a diagram explain what is meant by the term "Discrimination". Explain how good Discrimination is achieved in an electrical installation. (5 marks)
- (b) An apartment is to be supplied from a single phase 230V 50Hz supply. The load connected to the installation comprises of the following items:
- (i) Lighting: 24 twin fluorescent fittings, where each tube is rated at 80 Watts.
 - (ii) Power: two water pump motor rated at 4 kW each.
 - (ii) Cooking appliance: a cooker with a rated power 4kW. The control unit supplying this cooker has a socket outlet incorporated.

Calculate the assumed current demand for the installation by applying the diversity factor as provided in the table below and state what will it be your recommendation to the owner. (15 marks)

The table below gives the necessary diversity information that must be applied.

Purpose of the final circuit	Diversity to be applied
Lighting	66% of the total current demand
Heating and Power	100% full load of largest appliance + 75% full load of remaining appliances.
Cooking appliance	10 amperes + 30% full load of the connected cooking appliance in excess of 10 amperes + 5 amperes if a socket outlet is incorporated

2. (a) Draw a diagram to illustrate a TT system. Show in your diagram the power source transformer and a single-phase domestic household. Indicate on the diagram the consumer's earth electrode. (6 marks)
- (b) List four types of earthing arrangements recognised by the IET Regulations (4 marks)
- (c) With the aid of a diagram explain how you would install and test an earth electrode for a TT system. (7 marks)
- (d) What do you understand by:
- i. MCB
 - ii. RCD
 - iii. RCBO ? (3 marks)

3. (a) Describe the construction and operation of a simple single-phase circuit-breaker. (5 marks)
- (b) Draw a diagram showing the operation of a simple single-phase circuit-breaker. (4 marks)
- (c) Name five advantages which a circuit breaker has over a fuse. (5 marks)
- (d) Name five methods which can be used in conjunction with a circuit breaker to reduce arcing when the breaker operates. (5 marks)
- (e) Which of the above methods is used to reduce arcing in an MCB? (1 mark)
4. An extension is to be made to an existing installation. The electrician has the choice of completing the extension either in metal conduit or in MIMS cables. The following table shows the amount of material required and the selling price of each item for both types of installation.

Metal Conduit

Material Required	Cost
12.5 metres conduit	€137 per 90 metres
One through box	€1.97
Three couplings	€14 per 100
Three locknuts	€12.90 per 100
Two bushes	€29 per 100
28 metres cables	€10.60 per 100 metres
24 saddles	€19.10 per 100
Screw and plugs	€2.90

MIMS Cable

Material Required	Cost
14 metres of MIMS Cable	€186 per 100 metres
2 seals/glands	€16.48 per 10
50 fixing clips	€13.40 per 100
Screws and plugs	€3.40

- (a) Find the cost of the material if steel conduit is used. (6 marks)
- (b) Find the cost of the material if MIMS cable is used. (6 marks)
- (c) If the electrician charges 250% of the material cost as the labour cost if steel conduit is used and 180% if MIMS cable is used. Which is the cheaper installation and by how much? (8 marks)