

5. (a) Explain the importance of an earthing system in an electrical installation (5 marks)
- (b) Explain why we must have earth electrodes in electrical installation. (4 marks)
- (c) The supply voltage for a domestic installation is measured to be 230V and the external earth loop impedance Z_e is 0.7 Ω . A fault develops in the electrical installation and the resistance of the phase conductor from the fault up to the supply point was measured to be 0.09 Ω . Also the fault resistance was measured to be 2.8 Ω . Find the value of:
- i. The total earth fault loop impedance(Z_s) (3 marks)
 - ii. The fault current (3 marks)
- (d) What factors need to be considered when selecting a protective device to protect a given circuit? (5 marks)
6. (a) Write down a list of the risks associated with isolation and the effects isolation can have on people, livestock, systems and buildings. (4 marks)
- (b) Who will be at risk if inspection and testing is not carried out according to IEE regulations? (4 marks)
- (c) Assume that you are working in a hospital as a maintenance electrician and has been asked to switch off a socket outlet circuit. Explain the procedure to be followed. (4 marks)
- (d) State the risks involved when you are working on or near live conductors. (4 marks)
- (e) Who is responsible for signing in an Electrical Installation Certificate? (4 marks)



EXAMINATION: AUTHORISATION A

February 2017

Paper II (Electrical Installation Technology)

Time Allowed - 3Hrs

END OF PAPER



WRITE ALL YOUR WORK ON THE ANSWER BOOK PROVIDED. EVERY ANSWER SHOULD INCLUDE ALL WORKINGS, NECESSARY DIAGRAMS AND FORMULAE.

START EACH ANSWER ON A FRESH PAGE.

Choose any FIVE questions.

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. (4 marks)
- (b) Explain what is meant by:
 - i. Connected load to an installation, (2 marks)
 - ii. Maximum demand, (2 marks)
 - iii. Diversity (2 marks)
- (c) A household is supplied from a single phase 230V 50Hz supply. The electrical installation for this household comprises of the following circuits:
 - (i) One lighting circuit consisting of 5 filament lamps each rated 100W.
 - (ii) One lighting circuit consisting of 6 fluorescent fittings each rated 80W.
 - (iii) Two ring circuit each protected by a 32 Amp mcb.
 - (iv) A 3 kW cooker controlled from a cooker unit without a 13A socket outlet.

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. (10 marks)

The following table 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
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
Socket outlets and stationary equipment	100 % of first ring circuit + 40 per cent of remaining ring circuit.

2. In a bathroom the following appliances are to be installed:
 - i. Two decorative lighting fittings near the mirror
 - ii. A shaver socket outlet
 - iii. A hair dryer
 - iv. A heater

Explain in detail:

- (a) The type of fittings to be installed in the bathroom (5 marks)
 - (b) The method of switching that will be utilised to operate the equipment in the bathroom (5 marks)
 - (c) The location of the installed equipment relative to the zones specified in the IET regulation (5 marks)
 - (d) How the appliances would be earthed in order that the installation would be rendered safe. (5 marks)
3. (a) What instrument is used to check insulation resistance? (1 mark)
 - (b) Describe in detail, using diagrams if required, the above mentioned instrument. (5 marks)
 - (c) Before an installation is connected to the supply, insulation tests must be given:
 - i. Between each conductor and earth.
 - ii. Between conductors.

Describe in detail how to perform test (a). (5 marks)

Describe in detail how to perform test (b). (5 marks)

If the installation is too large to test as a whole, how would you go about testing the installation? (4 marks)
 - (d) If the installation is too large to test as a whole, how would you go about testing the installation? (4 marks)
4. (a) Using neat diagrams highlight the main differences between a double wound transformer and an auto-transformer. (8 marks)
 - (b) Give four restrictions where a step-down auto-transformer may not be used. (4 marks)
 - (c) Give two restrictions where a step-up auto-transformer cannot be used. (2 marks)
 - (d) Give three instances where an auto-transformer is commonly used. (6 marks)