

5. a) Explain why an ohm-meter must not be used to carry out an insulation resistance test on a 230V final sub-circuit. (3 marks)
- b) A multi-function test instrument is being used to measure voltage and current values of a live 230V electrical appliance. State **THREE** precautions relating to the test instrument that will ensure personal safety. (3 marks)
- c) A single-phase, 230V, 6 kW deep fryer has been repaired and has been returned for reconnection in a restaurant. The fryer incorporates MIMS elements and is connected to the supply via a flexible cord. The flexible cord has not been connected to the isolating switch.
- (i) State the **THREE** tests and checks that need to be carried out to ensure the fryer is safe to connect to the electricity supply. (6 marks)
- (ii) Two of the instrument tests stated in (i) can only be carried out with the fryer disconnected. For each of those tests state:
- The test instrument used
 - The test voltage, if applicable
 - How the test is carried out
 - A test result that permits connection to the power supply (8 marks)
6. a) Describe in your own words the points to keep in mind when planning a simple intruder alarm system. (8 marks)
- b) Make a neat and well-labelled diagram of an intruder alarm system having the following components:
- 1 off - Transformer
 - 1 off - Relay Unit
 - 4 off - window/door closed contacts
 - 1 off - main switch
 - 1 off - outside bell
 - 1 off - test button
 - 1 off - circuit off lamp
 - 1 off - circuit fuse. (12 marks)

END OF PAPER

EXAMINATION: AUTHORISATION A

February 2019

Paper II (Electrical Installation Technology)

Time Allowed - 3Hrs

**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) Draw a neat and well-labelled diagram of a florescent lamp circuit. Your diagram must show clearly the following components:
- Capacitor for suppression of radio interference
 - Starter
 - Lamp electrode heaters
 - Resistor for reducing capacitor surge
 - Choke
 - Capacitor for power factor correction
 - Circuit control switch. (10 marks)
- b) Draw a neat and well-labelled diagram of a bi-metallic strip thermostat as used for an electric iron. Your diagram must show clearly the following components.
- Heating element
 - Sole-plate of iron
 - Bi-metallic strip
 - Contacts
 - Adjusting nut
 - Control knob
 - Electric Supply. (10 marks)
2. 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) Explain what is meant by **Connected load** and **Maximum demand**. (5 marks)
- c) A small shop is to be supplied from a single phase 230V 50Hz supply. The load connected to the installation comprises of the following items:
- (i) Lighting: 20 florescent luminaires each of 100 Watts
 - (ii) Power: a machine of 8 kW
 - (ii) Power: a machine of 2 kW
 - (iii) 2 ring circuits each protected by a 32Amp MCB.

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
Heating and Power	100% full load of largest appliance + 75% full load of remaining appliances.
Socket- Outlets	100% of total current demand of largest point of utilization + 50% of current demand of every other point of utilization

3. a) A 230V 50Hz single phase supply extractor fan has a rating of 5kW at 0.8 p.f. lagging and is protected by a BS 88 Part 2 fuse. The distribution board is distant 40m away from the extractor fan. The cables used to supply the extractor fan are to be single core cables, PVC insulated, installed in steel trunking with three similar circuits. Assume an ambient temperature of 35°C and that the voltage drop in the cables is limited to 2.5%. Using the below tables and ignoring any diversity, calculate:
- (i) The full load current of the motor (I_L) (4 marks)
 - (ii) The rating of the fuse (I_n) (4 marks)
 - (iii) Minimum current rating of cables (4 marks)
 - (iv) Minimum cable c.s.a. (4 marks)
 - (v) Actual voltages drop in the cable. (4 marks)

Refer to Table s 3.1 to 3.4

6A	10A	16A	20A	32A	50A
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No of Circuits	1	2	3	4	5	6	7
C_g	1.0	0.8	0.7	0.65	0.6	0.57	0.54

Ambient temperature (°C)	25	30	35	40	45	50	55	60
C_a	1.03	1.0	0.94	0.87	0.79	0.71	0.61	0.50

Cross Sectional Area mm ²	Current carrying capacity (A)	Voltage drop mV/A/m
1	13.5	38
1.5	17.5	25
2.5	24	15
4	32	9.5
6	41	6.4
10	57	3.8
16	76	2.4

4. a) Prior to using an electric saw on a construction site, a user check finds that the insulation on the supply flex is damaged. What should be the correct procedure to follow in this case? (4 marks)
- b) On what colour background is the white cross of the **first aid points** drawn? (2 marks)
- c) Mention at least **one** type of fire extinguisher suitable for
- i) flammable liquids,
 - ii) for electric fires. (2 marks)
- d) What is the purpose of a bonding conductor? (2 marks)
- e) Before any work is done within an electrical installation, what is the first procedure to be done? (2 marks)
- f) State the **TWO** types of protection against electric shock used with electrical appliances outdoors. (4 marks)
- g) Why is inspection and testing of an electrical installation necessary on completion of the works? (2 marks)
- h) Which instrument is used in order to prove safe isolation of an electrical circuit? (2 marks)