

9. (a) Explain the need to measure and monitor the voltage and current at the Main Distribution Board of a three-phase installation. **(6 marks)**
- (b) Explain how energy is measured for outgoing three-phase loads supplied by dedicated MCCBs installed in a sub distribution board. **(4 marks)**
10. (a) Explain the need of a maintenance plan related to main distribution board of a three-phase electrical installation having a total current rating in excess of 60A but less than 300A. **(4 marks)**
- (b) Give the main specifications of a 200A three-phase 4-way TP&N vertical distribution board. Provide a bill of quantity for the same distribution board. Any assumptions are to be stated. **(6 marks)**



GOVERNMENT OF MALTA
MINISTRY FOR EDUCATION, SPORT, YOUTH
RESEARCH AND INNOVATION
DEPARTMENT OF EXAMINATIONS

EXAMINATION FOR AUTHORISATION B

Paper 1

Date: 5th July 2023

Time: 9:00 – 11:00 (Two hours)

END OF EXAMINATION PAPER

This examination paper includes ten questions. Candidates are requested to answer all questions showing 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 10 marks.

1. With reference to IET regulations, the choice of wiring system is affected by many factors. These includes the type of building, temperature, safety, cost, etc. Name and briefly explain **five** factors affecting the choice of a wiring system. **(10 marks)**

2. (a) Explain what is meant by a TT, earthing system and state whether this is the earthing system used in Malta. **(3 marks)**
- (b) i. In a TT earthing system are the neutral and earthing conductor separated from each other? **(1 mark)**
- ii. Give a reason for your answer. **(3 marks)**
- (c) Draw a diagram for a TT Earthing System. **(3 marks)**

3. Refer to conductor size calculations:
 - (a) What does the size of a cable depend on? **(3 marks)**
 - (b) Explain **any three** of the following correction factors, C_a , C_c , C_d , C_f , C_g , C_i , C_s . **(3 marks)**
 - (c) Consider an appliance rated 5 kW. The cable to be used is a 70° C thermoplastic flat sheathed cable. The supply voltage is 230 V, 50Hz. Assume an ambient temperature of 35° C, C_a to be 0.94 from table 4B1 and C_i equal to 1. Calculate and explain in the last two stages the procedure to be followed to obtain the correct conductor size. **(4 marks)**

4. (a) What is the effect of temperature on resistance on pure Metals, Alloys, Carbon, Insulators and Electrolytes? **(5 marks)**
- (b) A coil of copper wire has a resistance of 100 Ω when its temperature is 0°C. Determine its resistance at 70°C if the temperature coefficient of resistance of copper at 0°C is 0.0043/°C. **(5 marks)**

5. (a) Explain what is meant by the following terms when related to alternating current circuit.
 - Inductive reactance, **(2 marks)**
 - Impedance. **(2 marks)**
- (b) Draw a neat, labelled sketch showing how the Resistance, Inductive reactance and Capacitive reactance will vary with frequency. **(6 marks)**

6. (a) Define the term power factor. **(3 marks)**
- (b) Explain why power factor correction is required and how it is achieved. **(7 marks)**

7. (a) Name **five** types of Fire Extinguishers that are used to extinguish a fire. **(5 marks)**
- (b) Name **five** precautions that need to be taken into consideration when working near live electrical equipment. **(5 marks)**

8. (a) Temporary electrical installations are regulated by the local regulations, S.L. 545.24. Explain what the authorised provider must ensure for:
 - i. a public entertainment facilities and outdoor mobile units **(2 marks)**
 - ii. a decorative street lighting installation. **(3 marks)**
- (b) Electrical installations in mobile or transportable units are regulated by the IET wiring regulations, BS7671.
 - i. Explain how equipotential bonding is achieved for such units. **(1 mark)**
 - ii. Mention **four** requirements for plugs and connectors used to connect the unit to the supply. **(4 marks)**