

8. Three lamps A, B and C, having resistances of 720, 480 and 288 Ω respectively are connected in parallel. These resistances are connected to a 230 V supply by a cable of resistance 2 Ω (i.e., in series with the parallel network).

(a) Draw a diagram for the above configuration. (2 marks)

(b) Calculate:
(i) the total circuit resistance
(ii) the total current
(iii) the cable voltage drop
(iv) the current drawn by each lamp. (8 marks)

9. (a) Define the term **Electrical Energy**. (2 marks)

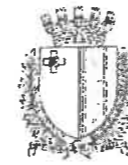
(b) Calculate the energy dissipated in a 10 Ω resistor when a current of 1.5 A flows for 25 seconds. (4 marks)

(c) Calculate the cost of operating a 3 kW heater for 15 hours if energy costs €0.05 per unit. (4 marks)

10. (a) With the aid of a diagram show the following parameters of an alternating current (a.c.) waveform.

(i) Time period of one cycle (1 mark)
(ii) Amplitude (1 mark)
(iii) Time and current (2 marks)

(b) With a well labelled diagram show the charge and discharge of a capacitor. (6 marks)



EXAMINATION FOR AUTHORISATION A
Paper 1

Date: 6th February 2023

Time: 15:30 – 17:30 (Two hours)

END OF EXAMINATION PAPER

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

1. (a) Electrical installations carried out in the Maltese Islands are regulated by local regulations, S.L. 545.24. Explain why these regulations are required. **(5 marks)**
- (b) Mention the Distribution System Operator in Malta and explain what service it provides. **(5 marks)**
2. (a) Give reasons why an overvoltage protection system is required in a single-phase installation. **(5 marks)**
- (b) Explain what the meaning of a **grid connected generator**. Explain how a grid connected generator is connected to a single-phase main distribution board. **(5 marks)**
3. (a) Explain why an authorised person must be able to read and understand the architect plans, the manufacturer's manuals and interior designer's furniture layouts. **(5 marks)**
- (b) Explain the need for an authorised person to provide the necessary documentation to his clients as required according to the law (S.L.542.24 Electrical Installation Regulations). **(5 marks)**
4. A single-phase, 230 V, 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. **(4 marks)**
- ii. Two of the tests stated in (i) can only be carried out with the fryer disconnected. For each of these 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.
- (6 marks)**

5. (a) A person is using a Class I electrical appliance supplied from a Residual Current Device (RCD) protecting a final sub-circuit. An earth leakage fault occurs and earth leakage current flows through the person's body. Explain why a person does not receive a severe electric shock when the earth leakage current flows through his body. **(4 marks)**
- (b) The phase and neutral on the supply side of a single-phase Residual Current Device (RCD) have been swapped. Would the RCD operate if it detected an earth leakage fault on the circuit it protects? Give a reason to support your answer. **(3 marks)**
- (c) Would an RCD operate if there was a short between neutral and earth on the circuit it protects? Give a reason to support your answer. **(3 marks)**
6. In a bathroom the following appliances are to be installed:
- two decorative lighting fittings near the mirror
 - a shaver socket outlet
 - a hair dryer
 - a heater
- Explain in detail:
- a) The type of fittings to be installed in the bathroom. **(2 marks)**
- b) The method of switching that will be utilised to operate the equipment in the bathroom. **(2 marks)**
- c) The location of the installed equipment relative to the zones specified in the IET regulations. **(3 marks)**
- d) How the appliances would be earthed in order that the installation would be safe. **(3 marks)**
7. Two 100 W, 230 V lamps are wired in series across a 230 V supply.
- (a) Draw a well labelled diagram for the above. **(2 marks)**
- (b) Calculate the power dissipated by each lamp and the total power dissipated. **(8 marks)**