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

# EXAMINATION FOR AUTHORISATION A

# Paper 1

**Date:** **Tuesday 1st July 2025**

**Time:** **09.00 – 11:30 (Two hours thirty minutes)**

**This examination paper includes ten questions. Candidates are requested to answer ALL questions clearly indicating the question number of the answered questions.**

**Write only your Index Number in the space provided in the booklet.**

**Candidates are requested to answer ALL questions in the booklet correctly listing the answered question number in the space provided on the booklet's front sheet.**

**Answers should be written in Blue/Black ink. Diagrams can be drawn in pencil.**

**All answers should include the necessary workings, diagrams and formulae.**

**Use a separate page for each different question.**

**Each question carries 10 marks.**

1(a) Define Ohm's Law. (2 marks)

1(b) A direct current circuit is made up of a combination of Resistors connected in parallel and in series as shown in Figure 1 below.

The values of the resistors are as follows:

| | |
|---|---|
| A | 5Ω |
| B | 5Ω |
| C | 5Ω |
| D | 10Ω |
| E | unknown resistance value |

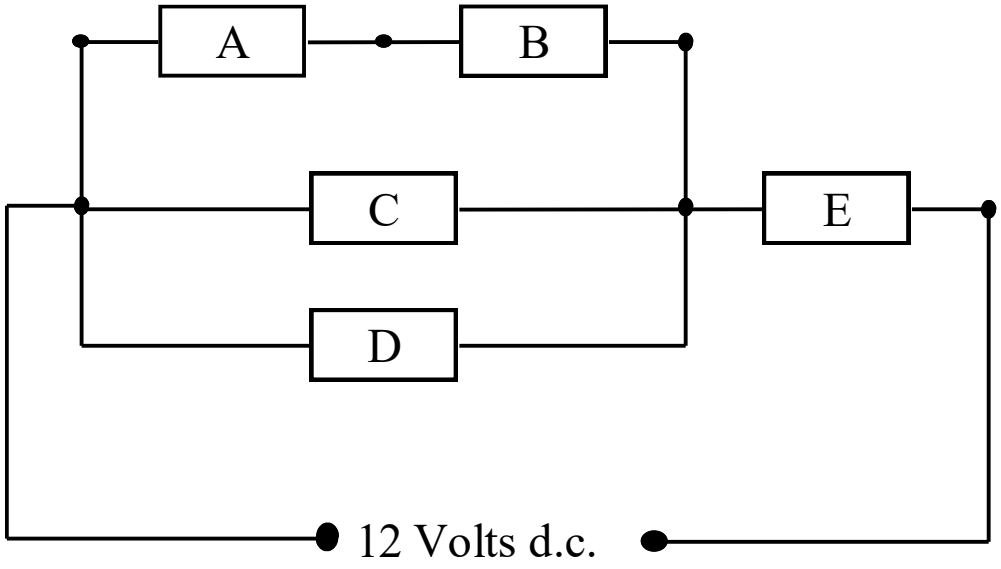


Figure 1

Calculate the:

(i) total current flowing in the circuit if resistor C dissipates 20 Watts (5 marks)
(ii) value of the unknown Resistor E. (3 marks)

2 (a) Define the term resistivity of material. (2 marks)

2 (b) Calculate the cross-sectional area (in $mm^2$) of an aluminium cable 100m long having a resistance of 0.284Ω. The resistivity of aluminium is $2.84\times10^{-8}\Omega m$. (4 marks)

2 (c) Find the cross-sectional area (in $mm^2$) of a copper cable of length 84m which carries a current of 32A and with a voltage drop of 3V. The resistivity of copper is $1.78\times10^{-8}\Omega m$. (4 marks)

3 (a) Draw a simple construction of a double wound single-phase transformer and describe the operational principles. (4 marks)

3 (b) A 230V primary side stepdown transformer is used to supply 55V to a construction site. The measured primary current is 20A. A resistive load composed of headlamps is connected across the secondary windings. (assume unity power factor).

Calculate the:

(i) resistance value of the headlamps (3 marks)
(ii) secondary number of turns if the primary number of turns is 2024. (3 marks)

4 (a) A coil is connected across a 110V DC supply and the measured current flow is 7A. The same coil is connected across a 230V, 50Hz supply, the measured current is 3.5A.

Calculate the:

(i) resistance of the coil (2 marks)
(ii) impedance (2 marks)
(iii) reactance. (3 marks)

(b) If a 23.5μF capacitor is connected in series with 215mH coil, state whether the circuit power factor is lagging or leading. Explain your answer. (3 marks)

5 (a) Classify the following equipment as *CLASS I* or *CLASS II*

| No. | Equipment | Class Type |
|---|---|---|
| 1 | Metal clad toaster | |
| 2 | Plastic moulded hair dryer | |
| 3 | Washing machine | |
| 4 | Cordless drill | |
| 5 | Metal clad cooker | |
| 6 | Small plastic portable FM Radio with DC input plug from a 230V AC powered switch mode power supply. | |

(6 marks)

(b) Indicate using *Yes* or *No* which of the following can be considered as extraneous conductive part.

| No. | Description | Yes or No |
|---|---|---|
| 1 | Main earth terminal | |
| 2 | Metal structure beams | |
| 3 | Metal pipework (water) | |
| 4 | PVC water pipework | |

(4 marks)

6 (a) Draw and label all the components (control and protection) for a main single phase consumer unit supplied from the distribution system operator energy consumption meter. The main consumer unit supplies 2 socket outlets ring circuits, 2 lighting circuits and a cooker circuit. The cooker circuit is supplied via a single phase, 20A, MCB.

Present a drawing showing only the CB's and other equipment as required by the IET regulations and local authorities. Show clearly in your drawing the proper sequence of the components, the CSA and colour of the interconnecting wires between the components.

(6 marks)

(b) Write the CB rating for the protection of the two lighting circuits having a total wattage load of

(i) 1000W power factor 1

(ii) 1000W power factor 0.5. (2 marks)

(c) What is the maximum floor area that can be served by

(i) 2.5 $mm^2$ ring final circuit

(ii) 4 $mm^2$ radial final circuit? (2 marks)

7(a) From the list of statements in the box below choose and write the best two reasons that accomplish the scope, object and fundamental principles of the IET wiring regulations BS 7671.

Safety of personnel.

Protection of equipment and electrical accessories.

Harmonisation of electrical equipment.

Prevent potential fire hazards breaking out from electrical circuits.

Raise awareness of the dangers involved with Electrical power.

(2 marks)

(b) What is the type of system earthing adopted in Malta? (2 marks)

(c) What type of electrical installation methods (infrastructure through which one lays the cores or cables) is advisable for the following situations for socket outlet and lighting final circuits?

**Situation A**:

Offices with possible future relocation of socket outlets ports in combination with CAT 5 cable network. (2 marks)

**Situation B**:

Lighting and Socket outlets

Garage with workshop activity where chasing of walls is not allowed. (2 marks)

**Situation C**:

Lighting final circuits in a domestic household with shallow soffits. (2 marks)

8 (a) State whether:

(i) the installation of 230V light fittings, or luminaries is permitted directly above a shower or bath (zone 1) in a room containing a bath or shower. (2 marks)

(ii) the installation of a 230V extractor fans is permitted in zones 1 and 2 of a room containing a bath or shower. (2 marks)

(iii) Explain what kind of protection is applied against the ingress of moisture. (2 marks)

(b) Can a 230V extractor be supplied from a lighting circuit? Explain your answer. (2 marks)

(c) State the type of switch that can be used for the 230V extractor fan and where it should be installed. (2 marks)

9 (a) Explain why it is important and necessary that an authorised person inspects and tests electrical installations. The reasons should include a practical scenario. (4 marks)

(b) List and briefly explain the three activities to be undertaken in sequence for a new installation, addition or alteration to an existing installation. (6 marks)

10 List the number of Periodic Electrical Installation Inspection required for each of the following types of installations.

(a) Swimming pools (2 marks)

(b) Caravan parks and gyms (2 marks)

(c) Commercial environments such as offices (2 marks)

(d) Rented homes i.e landlords and social housing (2 marks)

(e) Homeowners and property sellers. (2 marks)

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