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GOVERNMENT OF MALTA
MINISTRY FOR EDUCATION
AND SPORT

EXAMINATION FOR AUTHORISATION A

Paper 1

Date: Tuesday 30th June 2026

Time: 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 DC battery has an e.m.f. of 12 V and an internal resistance of 0.02 Ω. The battery is connected to a 12 V, 24 W lamp through a two-core cable of length 25 m. The resistance of the cable is 0.02 Ω per metre, per conductor.

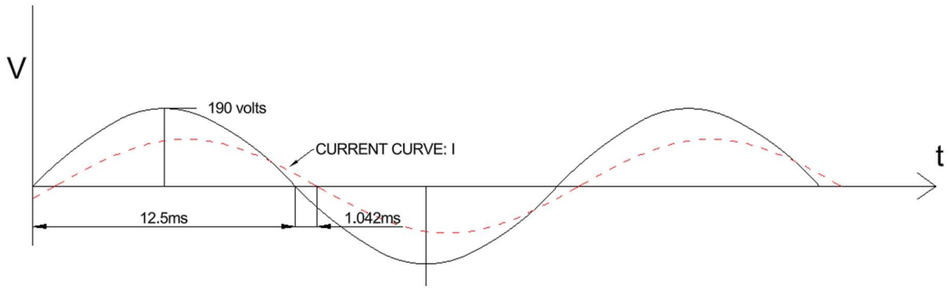
   (a) Draw an equivalent circuit, clearly showing the position of the lamp with respect to the cable resistances. (3 marks)

   (b) Calculate the equivalent resistance of the lamp when operating at its rated load of 24W. (2 marks)

   (c) Calculate the circuit current. (3 marks)

   (d) Determine the effective power dissipated by the lamp, assuming any change in lamp resistance is negligible. (2 marks)

2. A Variable Frequency Drive (VFD) is driving a machine and has the following wave output at the output terminals.



   (a) What is the period of the waveform? (2 marks)

   (b) What is the frequency? (2 marks)

   (c) Calculate the RMS voltage being applied on the machine. (2 marks)

   (d) The waveform in dotted lines is the current wave indicating the load current flowing into the machine. State if the load is inductive or capacitive. Give a reason for your answer. (1 mark)

   (e) If the delay between the voltage and current waveforms is 1.042 ms then what is the corresponding phase angle between the voltage and the current? (3 marks)

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9. (a) A client is required to re-certificate the electrical installation. There are various inspections that can be conducted however the electrical authorised person focused on the insulation resistance testing to *earth* of the installation. The following table (Table 3) records the insulation resistance values observed during the inspection/testing.

On your booklet copy the table below and complete by choosing *"pass"* for the correct insulation resistance value or "*fail"* for the incorrect insulation resistance value by ticking "✓" in the appropriate column. (5 marks)

After inspection/testing observations	Pass	Fail
Light circuit insulation value 0.5MΩ		
Ring circuit insulation value 2MΩ		
Radial circuit insulation value 10MΩ		
Cooker Unit circuit with cooker already connected 0.2MΩ		
Well water electrical pump circuit with pump already connected 0.1MΩ		

Table 3

(b) Name the type of instrument that is used to check the circuits listed in Table 3 above.
(1 mark)

(c) List FOUR common possible faults which attribute to the low insulation value results.
(4 marks)

10. (a) The IET BS 7671:2018 section 702 titled "swimming pools and other basins" specifies the zones' characteristics. Draw a plan of a swimming pool showing all the zones' dimensions according to regulation 702.3. (5marks)

(b) Draw a circuit diagram for the swimming pool lighting (three luminaires) according to IET BS 7671:2018 regulation. The circuit diagram should include the ingress protection code (IP) and the voltage rating for each item. (5 marks)

END OF EXAMINATION PAPER

3. A machine drives a load at a speed of 2750 rev/min and develops a shaft torque of 3.5 Nm.
   (a) Calculate the mechanical power delivered at the shaft. (3 marks)
   (b) The machine has an efficiency of 94%. Calculate the electrical input power required to produce the shaft power. (3 marks)
   (c) The machine is a single-phase motor connected to a 230 V supply.
   Given that the power factor is 0.86, calculate the current drawn by the machine.
   (4 marks)

4. Table 1 below lists common health-and-safety / hazard-prevention categories (A to E).

No	*Description*	*Category*
1	Fire-fighting equipment	A
2	Lifting aids	B
3	Live-circuit isolation	C
4	Working at height	D
5	Body members protection	E

Table 1

(a) The Table below (Table 2) lists ten items commonly used by an authorised person.
On your booklet copy the table below and next to each item write the letter which identifies the correct category to which it belongs. (10 marks)

Item	*Category*
Cherry picker	
Co2 cylinder	
Safety harness	
Gloves	
Safety shoes	
Safety glasses	
MCB	
Chain block/Pulley	
Dry powder	
Ladder	

Table 2

5. (a) State and briefly explain TWO reasons why earthing is required for Class I (earthed) equipment in single-phase installations. (4 marks)

(b) In a TT system, Earth Fault Loop Impedance (Z_s) is often significantly higher than in TN systems. Explain why this is the case and name THREE protective devices usually required to ensure safety. (6 marks)

6. (a) Explain the purpose of earthing in single-phase electrical installations. (3 marks)

(b) State and briefly explain TWO reasons for providing earthing in single-phase electrical installations. (4 marks)

(c) Using a circuit diagram of a single-phase electrical installation, explain the sequence of control and protection within the consumer's premises. (3 marks)

7. (a) Explain the benefits of a Two-Way lighting switching. (2 marks)

(b) Draw a two-way and intermediate lighting circuit, clearly labelling the diagram. (4 marks)

(c) Explain why a ring final circuit is often preferred over a radial circuit for supplying 13A socket outlets in a large room. Your answer should refer to conductor size and current sharing. (4 marks)

8. Figure 1 below shows a two-bedroom flat plan drawing Including the electrical general symbols used to indicate the electrical layout.

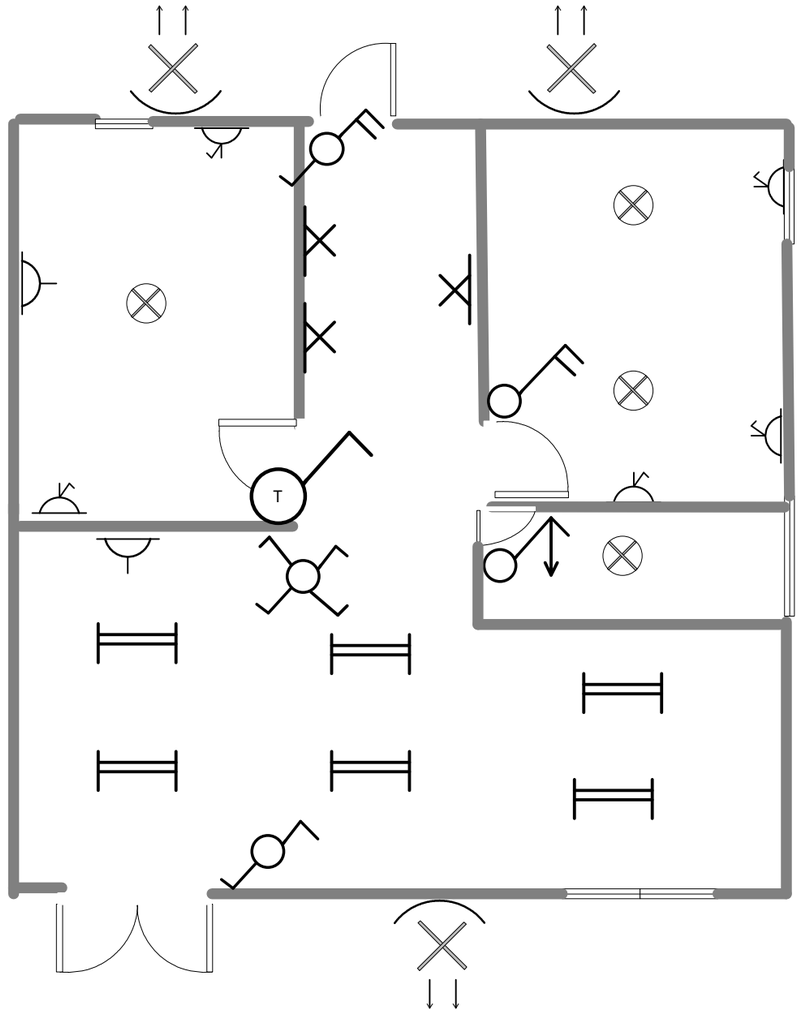


Figure 1

From the Figure above, choose and draw TEN different symbols and write the name for each symbol.
On your booklet present your answer in the following table format:

SYMBOL	NAME

(10 marks)