9. A measuring instrument has a resistance of 10 Ω and takes 40 mA to produce full scale deflection.

Calculate the resistance to use the instrument as:

i. An Ammeter reading 0 to 2 Amps **(5 marks)**
ii. A voltmeter reading 0 to 10 volts **(5 marks)**

10. Explain the difference between:

(i) Planned Maintenance **(3 marks)**
(ii) Breakdown Maintenance **(3 marks)**
(iii) Preventive Maintenance **(4 marks)**

Total: 100 marks

END OF EXAMINATION PAPER

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

EXAMINATION FOR AUTHORISATION B

Paper 1

Date: 7th February 2023

Time: 15:30 – 17:30 (Two hours)

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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) The resistance of an electrical conductor depends on four factors. List these factors. **(4 marks)**

   (b) The resistance of a coil of aluminium wire at 18°C is 200 Ω. The temperature of the wire is increased and the resistance rises to 240 Ω. If the temperature coefficient of resistance of aluminium is 0.0039/°C at 18°C determine the temperature to which the coil has risen. **(6 marks)**

2. (a) With reference to transformers explain the following:
   (i) Transformer core losses **(2 marks)**
   (ii) Hysteresis losses **(2 marks)**
   (iii) Eddy Current Losses **(2 marks)**

   (b) Explain what is meant by an **Isolating Transformers**. **(4 marks)**

3. A series circuit comprising a 12 Ω resistor connected in series to a 31.82 mH inductor are connected across a 200 v 50 Hz supply.

   (a) Draw the circuit diagram for the above. **(2 marks)**

   (b) Calculate:
   (i) The current drawn by the circuit **(5 marks)**
   (ii) The operating angle of the circuit. **(3 marks)**

4. (a) With the aid of a diagram explain the term **Power-factor**. **(3 marks)**

   (b) What are the causes of a poor power-factor? Explain at least **three** causes developed by a poor power-factor. **(3 marks)**

   (c) A power factor improvement capacitor is required to take a current of 10 A from a 230 V 50 Hz supply. Determine the value of this capacitor. **(4 marks)**

5. (a) The electrical installations of the Maltese Islands are regulated by the Local Regulations, S.L.545.24. Explain why these regulations are important. **(5 marks)**

   (b) Explain the main responsibilities for a Distribution System Operator and an Electrical Installation Authorised Person, both operating in Malta. **(5 marks)**

6. (a) Explain how the Distribution System Operator supplies electricity for a three-phase installation. **(5 marks)**

   (b) Explain and give an example how a three-phase installation is equipped with the necessary protection systems to ensure the safe operation of the equipment connected downstream. **(5 marks)**

7. (a) List the requirements of the Electrical Installation Regulations, S.L.545.24, regulation 14, in relation to the tests on completion of a three-phase electrical installation. **(5 marks)**

   (b) Explain the need for an authorised person to provide the necessary documentation related to three phase installations, protection and control of electric motors and switchgear modifications to his clients as required by the Subsidiary Legislation, S.L.542.24, Electrical Installation Regulations. **(5 marks)**

8. (a) Draw the circuit diagram of a three-phase four wire induction type energy meter for a load current up to 100 Amp. **(5 marks)**

   (b) If the load current is 300 Amp, therefore exceeding the input current rating of the energy meter, describe how you can still read the energy consumed by the load. **(5 marks)**