6. (a) If a lamp of luminous intensity *I* candela in all directions below the horizontal is suspended *d* metres above a surface. Draw a diagram to illustrate the situation and write down the formula for calculating the illuminance at a point P. **(4 marks)**

(b) A lighting fitting producing luminous intensity 1500 candela in all directions below the horizontal is suspended 4 m above the floor. Calculate the illuminance produced at a point P immediately below the lamp. **(8 marks)**

(c) If the lighting fitting is raised by 1m, what would be the new illuminance at P?

(8 marks)

Total: 100 marks

END OF EXAMINATION PAPER

DEPARTMENT OF EXAMINATIONS
THE MALL, SARRIA STREET, FLORIANA, MALTA

Examination for Authorisation A

Paper 1: **Theory**

Date: **3 February 2020**

Time: **09:00 – 12:00 (Three hours)**

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This examination paper contains six questions. Candidates are requested to answer any FIVE (5) 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 20 marks.

1. A coil of inductance 0.15 Henries and resistance 10 ohms is wired in series with a 60 micro farad capacitor to a 240 Volts, 50 Hertz supply.

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

   (b) Find the resultant reactance in the circuit. **(4 marks)**

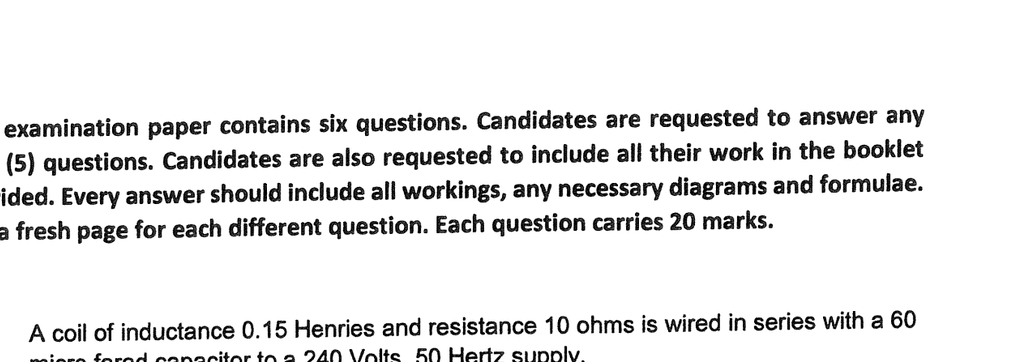
   (c) Find the circuit impedance. **(4 marks)**

   (d) Find the current which flows in the circuit. **(5 marks)**

   (e) Find the voltage drop across the capacitor. **(5 marks)**

2. (a) State Ohm's law as applied to a direct current (d.c.) circuit. **(3 marks)**

   (b) For the circuit shown below, find the current (I) in the 3 ohm resistor.



(17 marks)

3. The current at resonance in a series circuit consisting of a resistor, capacitor and an inductor is 100μA. If the applied voltage is 2mV at a frequency of 200kHz and the circuit inductance is 50mH, calculate:

   (a) the circuit resistance **(8 marks)**
   (b) the circuit capacitance **(8 marks)**

   Draw the diagram showing the circuit configuration. **(4 marks)**

4. (a) Name ANY three types of capacitor commonly used. **(3 marks)**

   (b) A circuit is made up of three capacitors of values 4 μF, 6 μF and 12 μF respectively. The capacitors 4 μF and 6 μF are connected in parallel and in series with the 12 μF capacitor. The circuit is connected across a 300 Volt d.c. supply.

   Calculate the following:

   (i) the total capacitance **(3 marks)**
   (ii) the charge stored **(3 marks)**
   (iii) the energy stored **(4 marks)**

   (c) Consider the above arrangement as specified in part (b) above and carry out the following:

   (i) Draw a well labelled circuit diagram for the above arrangement. Include the capacitors' values accordingly. **(2 marks)**
   (ii) Calculate the value of a single capacitor which will be equivalent to the above arrangement. **(5 marks)**

5. (a) Define the following **cells**:
   (i) primary cells
   (ii) secondary cells **(4 marks)**

   (b) The heating element of 2.4 ohm resistance is connected to a battery of e.m.f. 12 Volts and internal resistance of 0.1 ohm.

   (i) Draw a well labelled circuit for the above heating element described in part (b) above. **(2 marks)**

   Calculate the following:

   (ii) the current flowing **(4 marks)**
   (iii) the terminal voltage of the battery on load, and **(3 marks)**
   (iv) the power dissipated by the heater. **(3 marks)**

   (c) Calculate the **internal resistance** of a battery if its e.m.f. is 6 Volts and the potential difference across its terminals is 5.8 Volts. Consider the current flowing in the circuit when the battery is connected across a load to be 0.5 Amp. **(4 marks)**