



6. (a) What do you understand by the term **stroboscopic effect** of light emitted by fluorescent lamps? **(4 marks)**
- (b) Why are stroboscopic effects dangerous in workshops and plant rooms? **(2 marks)**
- (c) State **three** methods of reducing or eliminating stroboscopic effects. **(6 marks)**
- (d) Give **one** advantage where stroboscopic effects could be advantageous and explain briefly how this is done. **(4 marks)**
- (e) Why do stroboscopic effects not occur when the supply is from a battery or from rectified AC Current? **(4 marks)**

**Total: 100 marks**

**END OF EXAMINATION PAPER**

**EXAMINATION FOR AUTHORISATION B**

**Paper 2: Electrical Installation Technology**

**Date: 15 July 2022**

**Time: 09:00 – 12:00 (Three hours)**

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) Draw a well labelled diagram for the following three-phase motor starters and give a brief description on how **each** operates:
- i. Star-Delta starter
  - ii. Auto Transformer starter. **(14 marks)**
- (b) List the advantages and disadvantages for both of the above motor starters. **(6 marks)**

2. (a) Define the following terms:
- i. Maximum Demand **(2 marks)**
  - ii. Diversity. **(2 marks)**

(b) Refer to Table A1 and Table A2 accordingly:

Where not stated, assume a supply voltage of 240 V, 50 Hz. By applying diversity estimate the Maximum Demand for a small office which comprises the following:

- i. **Lighting:** 24 fluorescent luminaires 100 W each
- ii. **Power:** a 15 kW machine and a 2.5 kW (at 240 Volts) machine
- iii. **Socket-outlets:** three 32 A circuits
- iv. **Motor Circuit:** A 2.75 kW single-phase motor with a power factor of 0.8. **(10 marks)**
- v. **Cooker Circuit:** The electric cooker consists of the following:
  - hob comprising 4 off 2.5 kW elements
  - main oven 2.5 kW and
  - a grill/top oven 2.5 kW. **(6 marks)**

3. (a) Draw a labelled circuit diagram of:
- i. DC Series motor
  - ii. DC Shunt motor
  - iii. DC Compound motor **(3 marks)**
- (b) How would you obtain speed control of a DC Series motor? Can this DC motor be connected to an AC supply? Explain why. **(2 marks)**
- (c) What is the main difference of an Induction Squirrel-Cage Rotor motor from an Induction Wound Rotor motor. Give **one** application for each type. **(4 marks)**
- (d) What starter would you recommend to start an Induction Wound Rotor motor? **(1 mark)**
- (e) Draw a circuit diagram showing a Wound Rotor Induction motor connected to its starter **(10 marks)**

4. A small restaurant is to install a small Stand-By Generator to supply the essential services. The essential service circuits will be supplying the following load:
- Refrigeration Cubicles
  - Security and other important lighting circuits
  - Electric Ovens
  - UPS and Servers for the computers.

The total demand of the restaurant is 80 kVA and the essential load is calculated to be 45 kVA.

- (a) Draw a detailed diagram of how the generator will be connected to the installation and explain how the essential services could be segregated from the non-essential services. *(No control wiring is required)* **(9 marks)**
- (b) What type of earthing is required for the generator and how this will be carried out? **(3 marks)**
- (c) What type of Change Over Switch is required? **(2 marks)**
- (d) Which tests will be carried out
- i. before commissioning such a system **(3 marks)**
  - ii. annually on the generator? **(3 marks)**

5. (a) Small transformers such as those used in domestic installations normally require no artificial cooling. However, in large three-phase transformer cooling is necessary. Write short notes describing how these transformers are usually cooled. **(3 marks)**
- (b) With the aid of a clear, well labelled diagram describe an Auto-Transformer. Your diagram should show the distribution of voltages and currents in the transformer. **(4 marks)**
- (c) What is a Current Transformer and where is it used? **(2 marks)**
- (d) With the aid of a clear, well labelled diagram describe a Current Transformer. **(6 marks)**
- (e) How is a Current Transformer rated? Give some examples. **(2 marks)**
- (f) For a transformer write the formula for finding:
- i. The All-day Efficiency
  - ii. Regulation
  - iii. Maximum Efficiency. **(3 marks)**