

Section B – All questions carry equal marks. Answer **all** questions. Show **all** calculations.

- 3 a) State **three** reasons for dividing an installation into circuits. (3 marks)
b) List **seven** characteristics of equipment, which may have harmful effects on other installed equipment, that should be assessed. (7 marks)
c) Explain what must be considered, when designing an installation giving consideration to maintainability. (5 marks)
d) List **five** fundamental principles which need to be taken into account when determining the number of circuits due to the nature of demand. (5 marks)
- 4 A commercial office installation is to be designed with the protective measure of Automatic Disconnection of Supply. The supply and installation form a three-phase 400/230 V TN-C-S system.
a) Explain the **two** methods of Basic Protection that must apply. (6 marks)
b) Give **four** examples where Additional Protection by use of an RCD may apply. (4 marks)
c) Detail the requirements for Additional Protection by an RCD. (3 marks)
d) Give **two** examples of circuits that must disconnect within **each** of the following disconnection times.
i) 0.4 seconds.
ii) 5 seconds. (4 marks)
e) Explain how Class II equipment provides protection against faults. (3 marks)
- 5 a) Detail the specific design criteria to be met when designing an electrical installation in a building categorised as CA2. (10 marks)
b) Detail the requirements to be met for any electrical wiring system installed in an escape route within a building classified as BD4. (10 marks)
- 6 a) Explain how reduced low voltage systems are arranged in order to provide fault protection. (8 marks)
b) Explain, in detail, how Additional Protection is provided by supplementary bonding. (8 marks)
c) Describe a situation where supplementary bonding would be required to satisfy the requirements of BS 7671. (4 marks)
- 7 Describe, giving examples, the purpose of **each** of the following.
a) Isolation. (3 marks)
b) Switching for mechanical maintenance. (4 marks)
c) Emergency switching. (3 marks)
d) Functional switching. (3 marks)
e) Fire-fighters switching. (4 marks)
f) Undervoltage protection. (3 marks)
- 8 a) Describe, with regard to the design of circuit cables where power factor applies, how correction for voltage drop is applied to circuit conductors where their cross-sectional area
i) is 16 mm² or less (5 marks)
ii) exceeds 16 mm² (5 marks)
b) Describe what must be considered when selecting circuit conductor cross-sectional areas where a three-phase balanced load produces an additional third harmonic content of 20%. (10 marks)