



THE OPEN UNIVERSITY OF SRI LANKA
 DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING
 DIPLOMA IN TECHNOLOGY / BACHELOR OF TECHNOLOGY
 FINAL EXAMINATION - 2005

**ECX4234/ECD2223 ELECTRICAL INSTALLATIONS/
 DESIGN OF ELECTRICAL INSTALLATIONS**

Duration – THREE hours

Date: 7 May 2006

Time: 0930 – 1230 hrs

INSTRUCTIONS TO CANDIDATES

Answer ANY FIVE questions

Time allowed – THREE hours

All questions carry equal marks.

Use of pocket calculators is permitted. However, your answer should clearly indicate the calculations performed in each step, prior to indication of the answer.

Graph paper is available on request.

This question paper consists of 8 questions and 4 pages.

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- 1(a). Explain clearly the need for the 'IEE Wiring Regulations' and the Electricity Act
 - (b). Explain the need to have an 'installation earth electrode' in the TT system.
 - (c). Explain the construction of an 'installation earth electrode'. How does one reduce the value of the earth-resistance of an 'installation earth electrode', and why does this become necessary?
2. (a) What are the devices used in an electrical installation for protective purposes, and indicate the types of protection is provided by these devices?
 - (b) What is meant by the 'fault level' as applicable to an electrical installation? What is its relationship to the 'prospective fault current' ?
 - (c) A supply to a domestic installation is to be provided from a point in a distribution network where the 'prospective fault current' is 3500 A. Determine the maximum value of the earth loop impedance at the input point of the installation if the installation is protected by a 63 A m.c.b. whose characteristic is given at the end of the question paper ?
3. The owner of a premises, indicates the following loads to be essential to the electrical contractor -
 - 12 nos. incandescent lamps each controlled by a switch
 - 16 nos. **fluorescent** lamps each controlled by a switch
 - 1 no. ring circuit supplying 13A socket outlets fed from a 30A m.c.b.
 - 2 no. air conditioner consuming 16 A at 0.8 power factor lag at full load
 - 1 no. refrigerator, with a full load of 800W

- 2 nos. pedestal fans with a maximum power consumption of 75W each
- 4 nos. ceiling fans
- 1 no. microwave cooker/oven rated at 750W
- 1 no. water pump rated at 1 HP
- 1 no. colour television rated at 225W

Assuming that you are the electrical contractor, design a suitable distribution system to cater to the owners demand and conforming to the rules. Give a sketch of the sub-circuits recommended by you with the ratings of the m.c.b.s
Determine the maximum demand of the premises. Justify briefly your design.

- 4 (a) Explain why we consider the floor area when we use a 'ring circuit' rather than the number of socket outlets.
 - (b) Explain how different types of cables having the same 'conductor cross-sectional area' can have different current ratings.
 - (c) Explain the necessity of having a free space in a conduit or trunking when it is used to draw electrical cables through it.
 - (d) 4 nos. 6 mm² cable, 6 nos. 2.5 mm² cable and 12 nos. 1 mm² cable are to be put inside a duct. Determine the size of duct that you would recommend. Explain your decision.

5. (a) Define the terms 'average load', 'maximum demand' and 'peak diversity factor' in relation to an electrical installation.
 - (b) What is meant by a two-part tariff? Use the current 'general purpose' tariff used in Sri Lanka to explain. How does a 'time of day' tariff differ from the above. What advantage does such a tariff have for (i) the user, and (ii) the supply authority.
 - (c) Indicate the 'domestic tariff' structure used in Sri Lanka. What difference was made recently to the structure of this tariff in the last revision?

6. (a) Briefly explain 'electric shock' experienced by humans and animals.
 - (b) What is meant by the resistance of the human skin and human body and why does it vary?
 - (c) Explain 'touch voltage' and 'step voltage' in relation to the human body.
 - (d) How does the 'IEE Wiring Regulations' provide for the protection of 'electric shock'?

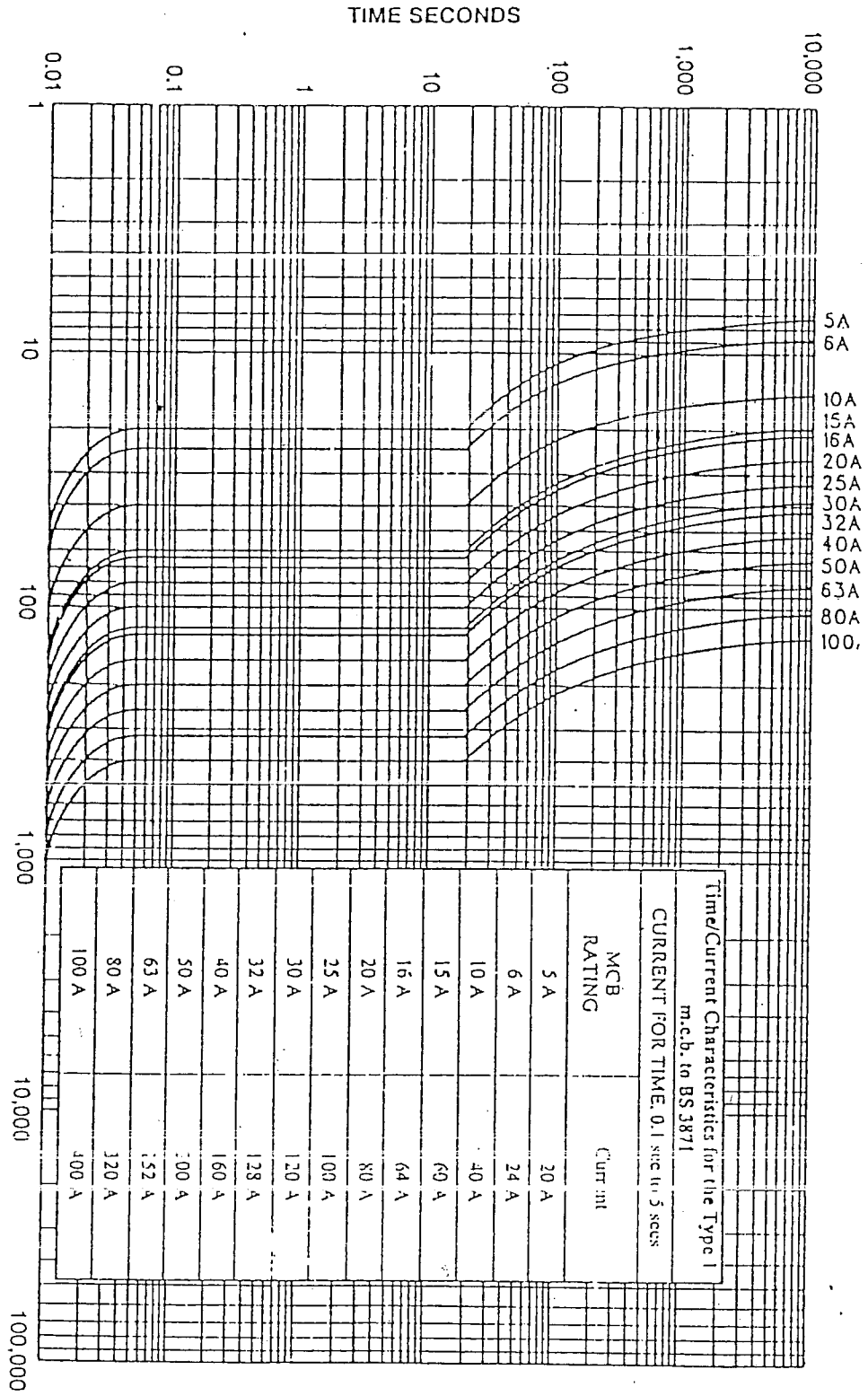
7. (a) Before starting on an installation that requires a new supply, what information should be obtained from the 'electricity supply authority'
 - (b) What are the colours used currently to identify the cores of electrical cables – single phase and three phase?
 - (d) What are the measures to be adopted when using the new core colour cables in an extension to an old installation?

8. (a) Explain 'discrimination' as applied to a protective device. Why is discrimination necessary when using a 'protective device' ?
 - (b) Explain the difference between 'overload' and 'short circuit'. How does (i) a fuse, and (ii) a miniature circuit breaker distinguish between them. Use the characteristics

of the devices to explain.

- (c) What are the advantages of a TN-S system over a TT system ? Which of these systems is used in Sri Lanka?

PROSPECTIVE CURRENT, r.m.s. AMPERES



Time/Current Characteristics for the Type 1
m.c.b. to BS 3871
CURRENT FOR TIME 0.1 sec (t_{0.1}) 5 sec

MCB RATING	Current
5 A	20 A
6 A	24 A
10 A	40 A
15 A	60 A
16 A	64 A
20 A	80 A
25 A	100 A
30 A	120 A
32 A	128 A
40 A	160 A
50 A	200 A
63 A	252 A
80 A	320 A
100 A	400 A