



COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY
SCHOOL OF ELECTRICAL ENGINEERING & ELECTRONICS ENGINEERING
CERTIFICATE IV IN ELECTRICAL ENGINEERING, STAGE 4
EEE 445 ELECTRICAL INSTALLATION TECHNOLOGY B
FINAL EXAMINATION – PENSTER 3, 2014

Date: Tuesday, 29th July, 2014 **Venue:** JNC **Time:** 9.00 am to 11.10 am

INSTRUCTIONS TO STUDENTS

1. You are allowed 10 minutes Extra reading time during which you are NOT to write
2. Two hours only is the time allocated for candidates to do this examination paper
3. Begin each answer on a fresh page and use both sides of the sheet.
4. Write your candidate-number at the top of each attached sheet.
5. Insert all written foolscaps, graph paper, drawing, etc. in their correct sequence and secure with string.
6. For all sheets of paper on which rough/draft work has been done, cross it through and you MUST ATTACH to your answer scripts.
7. Write clearly the number(s) of the question(s) attempted on top of each sheet.
8. ANSWER ALL QUESTIONS.
9. Show all workings where necessary.
10. Do not use programmable calculators, especially the ones that do the conversion of number systems.
11. AS/NZS STANDARD WIRING RULE BOOK IS PERMITTED
12. ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE ROOM.

SECTION A - ANSWER IN BRIEF**(20 MARKS)**

When answering quote the relevance clauses from the AS/NZS:3000 Wiring Rule Book

Question 1 (3 marks)

Determine whether it is applicable to use MEN (Multiple Earth Neutral) system on SELV (Special Extra Low Voltage) circuits.

Question 2 (3 marks)

Specify the two functions associated with the safe design and construction and proper operation of any electrical installation.

Question 3 (2 marks)

Relate how relevant environmental influences affecting an installation can be overcome? State the two applicable methods?

Question 4 (3 marks)

Specify three reasons why certain cables are derated from earthing?

Question 5 (3 marks)

Interpret the word “disturbance” to wiring systems in accordance to the AS/NZS and state the five situations that are deemed likely to cause disturbance?

Question 6 (3 marks)

Discuss the application of installation couplers and areas of utilization.

Question 7 (3 marks)

Relate between switching devices application and the induction motor, how do they correlate?

SECTION B - RENEWABLE ENERGY (20 MARKS)

Question 1 (10 marks)

- (a) Discuss briefly the term *biomass renewable energy*. (3 marks)
- (b) Sketch and label fully a typical biomass renewable energy system. (4 marks)
- (c) State the waste by-products of biomass? (3 marks)

Question 2 (10 marks)

- (a) Briefly explain the term *photovoltaic* (3 marks)
- (b) What is solar power? (3 marks)
- (c) Sketch a diagram of a solar power and label all parts. (4 marks)

SECTION C - CALCULATIONS (60 MARKS)

Question 1 (35 marks)

1.1 Determine the maximum demand of a single domestic installation supplied by a single-phase (240V) power supply with the following loads (a to l). Note that the house is 25metres away from the Supply Authority's pillar-box.

- | | |
|-------------------------------------|--|
| (a) 30 × lighting points | (g) 2 × 15 A socket outlets |
| (b) 12 m × lighting track | (h) 1 × 12 kW range |
| (c) 15 × 10 A single socket outlets | (i) 1 × 4.8 kW water heater |
| (d) 10 × 10 A double socket outlets | (j) 2 × 60 W exhaust fans |
| (e) 6 × 50 W ceiling fans | (k) 1 × 4.8 kW tennis court lighting |
| (f) 2 × 1 kW strip heater | (l) 1 × 3.6 single phase air conditioner |

1.2 Determine the cable size

1.3 Determine the depth of the cable buried underground

1.4 State the procedures to be taken to protect the main cable from damage

1.5 Determine the correct rating of the main switch circuit breaker necessary for the switchboard?

Question 2 (16 marks)

A solar power needed to supply power to an air conditioner with load specifications: 240V, 7 Amperes and p.f. = 0.85. Deep cycle battery capacity 400 Ah @ 12.6Vd.c and solar panel rating 150 Watts with 5 hours full sun a day.

Demonstrate your design by determining the following:

- 2.1 number of batteries (7 marks)
- 2.2 number of solar panels (4 marks)
- 2.3 the inverter/charger capacity for this particular installation (5 marks)

Question 3 (9 marks) Micro-hydro power.

- 3.1 Elaborate the terms static head and dynamic head in relation to micro-hydro power. (4 marks)
- 3.2 Determine the annual energy output for a micro-hydro supplying a domestic house.

Specification:

- (i) Water flow rate - 20 L/s
- (ii) Variation in efficiency - 50%
- (iii) Gravity constant - $9.8 \text{ m}^2/\text{s}$
- (iv) Static head - 20 metres (5 marks)

END