



## **SCHOOL OF ELECTRICAL AND ELECTRONIC ENGINEERING**

**CERTIFICATE IV IN ELECTRICAL ENGINEERING – STAGE 5**

**EEE449-ELECTRICAL INSTALLATION TECHNOLOGY C**

**FINAL EXAMINATION PAPER – PENSTER 1 -2013**

**DAY/DATE: \_\_\_\_\_ TIME: \_\_\_\_\_ ROOM: \_\_\_\_\_**

### **INSTRUCTIONS TO STUDENTS:**

1. You are allowed 10 minutes extra reading time during which you are not allowed to write.
2. Begin each **SECTION** on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each answer sheet.
4. Insert all foolscaps, graph paper, drawing paper etc in their correct sequence and secure with string.
5. For all sheets of paper on which rough / draft work has been done, cross it through and you must attach to the answer booklet.
6. Write clearly the number(s) of the question(s) attempted on top of each sheet.
7. **SAA WIRING RULE BOOKS ARE ALLOWED**
7. **ATTEMPT ALL QUESTIONS**

**SECTION A**

**(60 MARKS)**

1. List five (5) specific locations for emergency lighting in buildings.  
(5 marks)
2. Circuit breakers are classified by consideration of the means used to obtain tripping action. List the four types of tripping mechanism used in circuit breakers.  
(4 marks)
3. Define voltage surge, how is it caused and the protection required.  
(4 marks)
4. A three phase 240V/415V 1000 KVA transformer is supplying load through mains and bus-, mains. If the prospective fault current of the transformer is given as 27800 A and impedance per phase of the mains is 0.0030 and the sub-main is 0.020.

Calculate the fault current at:

- a) transformer
- b) main switchboard
- c) sub-board  
(9 marks)

5. Explain the following types of distribution system:

- a. Radial distribution
  - b. Loop/ring distribution
- Support your answers with the aid of neat diagrams.

(10 marks)

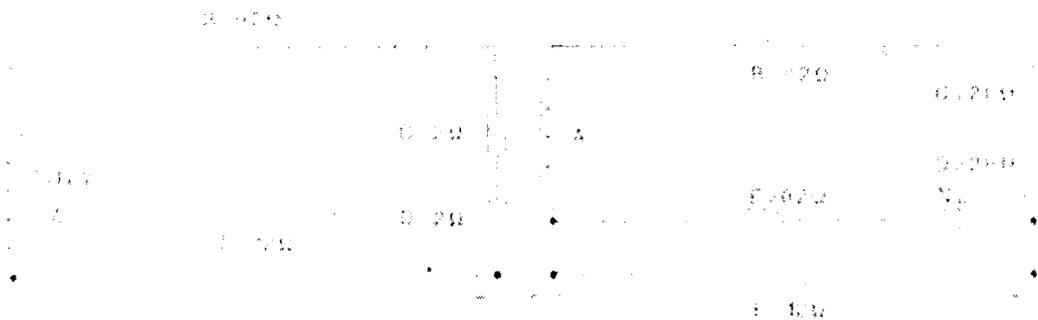
6. With the help of a diagram, show the fault current path in a MEN system and accordingly explain what fault loop impedance is.

(5 marks)

7. Calculate the fault currents in the circuit shown in (Fig. 1) for:

- (a) direct earthing system
- (b) multiple earthed neutral (MEN) system

(9 marks)



8. Explain the operation of any one of the three types of miniature circuit breakers namely magnetic trip, thermal trip or thermal magnetic trip.  
(4 marks)
9. State the procedure for carrying out:  
i) Insulation resistance test  
ii) Earth resistance test  
(4 + 3 = 7 marks)
10. Fuses are time delay rated to indicate the relationship between the current through the fuses and the time it takes for the fuse to open. Name the three time delay ratings of fuses.

(3 marks)

**SECTION B**

**(40 MARKS)**

1. The following load is connected to a three phase 240/415 volts supply in a domestic installation.
- (a) 20 lighting points at 60 watts each
  - (b) 10 only G.P.O
  - (c) 1 x 3 Phase 7.0kW range, comprising (4kw hotplates , 3.0kw oven)
  - (d) 1 x 2.5 kW air conditioning unit (single phase)
  - (e) 1 x 10.8 kW instantaneous water heater (3 phase)
  - (f) 1 x 2.0 kW clothes dryer (single phase)

Arrange the loads over the three phases so that it is balanced, hence calculate the maximum demand.

(14 marks)

2. A circuit wiring has the following information (Table B2 is provided at the back of the question paper)

Consumer Mains:	Length	-	10m
	Current	-	50A
	Cable	-	6mm <sup>2</sup>
Submains:	Length	-	20m
	Current	-	30A
	Cable	-	6mm <sup>2</sup>
Final Subcircuit:	Length	-	12m
	Current	-	15A
	Cable	-	2.5mm <sup>2</sup>

- (a) If the supply is three phase 240 volts, calculate the voltage drop over the route length of the circuit.
- (b) State if the voltage drop is in accordance with the rules.
- (c) If the answer is NO in part (b) above, show with necessary calculations the changes required so that the voltage drop is within the rules.

(10 marks)

***With the help of a rule book, attempt the following question, also state the clause number and page number***

3. In substations fire hazard can arise from transformers and switchgear. List four aspects to be taken into account when providing for fire protection in substations.  
(4 marks)
4. How should the circuits for safety services be installed with the remainder of the electrical installation?  
(2 marks)
5. List down three disadvantages of semi-enclosed rewirable fuses.  
(3 marks)
6. What is a Residual current device (RCD)?  
(2 marks)
7. Can an autotransformer be used to supply electrical equipment including circuit wiring?  
(2 marks)
8. Outline two situations or conditions under which no switch or circuit breaker shall be inserted in the neutral.  
(3 marks)

**#####END OF QUESTION PAPER#####**