



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

### **CERTIFICATE IV IN ELECTRICAL ENGINEERING – STAGE 3**

#### **EEE395- ELECTRICAL INSTALLATION TECHNOLOGY A FINAL EXAMINATION PAPER – 2014**

**DAY/DATE: Friday/1<sup>st</sup> August TIME: 9:00 – 11:10am**  
**ROOM: C303**

#### **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.
8. Show **all workings** where necessary.
9. **SAA Wiring** rule books are allowed
7. **ATTEMPT ALL QUESTION**

**SECTION A**

**(40 MARKS)**

**ANSWER ALL QUESTIONS AND ALSO WRITE DOWN THE APPROPRIATE RULE NUMBERS.**

1. Division of circuits falls logically into several categories, each an individual circuit or group of circuits. List five (5) circuit groups normally selected in any installation.  
(6 Marks)
2. List the voltages available for the following :
  - (a) Extra-Low Voltage
  - (b) Low Voltage
  - (c) High Voltage(4 Marks)
3. Define the following terms:
  - Cable
  - Circuit
  - Enclosure(3 Marks)
4. Outline the five factors to be considered when designing an electrical installation.  
(6 Marks)
5. What are the four (4) methods of determining the maximum demand of an installation?  
(5 Marks)
6. List three types of protective devices that can be used for the protection against both overload and short-circuit currents.  
(4 Marks)
7. Outline four (4) situations where main switches need not be located on a switchboard.  
(5 Marks)
8. What is the maximum permissible voltage drop recommended for a low voltage installation?  
(2 Marks)
9. What height above ground, floor or a suitable platform should a main switch should be located?  
(2 Marks)
10. What is the recommended size of main earthing conductor required for the following nominal sizes of active conductors?
  - (a) 6 mm<sup>2</sup>
  - (b) 16 mm<sup>2</sup>(3 Marks)

**SECTION B**

**(60 MARKS)**

1. Outline four advantages of alternating current over Direct current.  
(4 Marks)
2. What are the four basic reasons for using high voltage in transmission and distribution of electricity?  
(4 Marks)
3. Name four sources of extra low voltage supplies.  
(4 Marks)
4. Determine the minimum – permissible cable size for V75 thermoplastic – insulated copper conductors in PVC conduit used as the consumer’s mains for a single phase 240V domestic supply and protected by circuit breakers.  
  
Voltage drop considerations may be neglected once the load consists of:
  - ❖ 12 lighting point
  - ❖ 6 x single 10A GPO’s
  - ❖ 4 x double 10A GPO’s
  - ❖ 1 X 15A socket outlet
  - ❖ 1 x 1KW range
  - ❖ 1 x 1 KW Air Conditioner(12 Marks)
5. Electrical power is generated in many ways through different power stations in Fiji . List the names of four different types of power stations and the places they are located.  
(6 Marks)
6. List four advantages of extra-low voltage supplies over Low-voltage suppliers.  
(4 Marks)
7. Name four different types of cables used in the electrical industry.  
(4 Marks)
8. What are the three types of distribution systems commonly used?  
(3 Marks)
9. Explain the following terms:
  - (a) Lockout
  - (b) Tagout(4 marks)
10. Outline the procedure (5 Steps) of erecting ladders.  
(5 marks)

11. Monasavu Hydro and as of lately Nadarivatu Hydro Scheme , supply electricity to the majority of Viti Levu. Draw a single line diagram showing the supply of electricity from Monasavu to FNU Ba campus.

**(Label the various Western substations,voltage values,type of transformers used)**

(10 marks)

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



**SCHOOL OF ELECTRICAL AND ELECTRONIC  
ENGINEERING**

**CERTIFICATE IV IN ELECTRICAL ENGINEERING – STAGE 3**

**EEE395- ELECTRICAL INSTALLATION TECHNOLOGY A  
FINAL EXAMINATION PAPER – 2014**

**DAY/DATE:Friday/1<sup>st</sup> August TIME: 9:00-11:10am  
ROOM: C303**

**MARKING SCHEME**

## **SECTION A**

**(40 MARKS)**

**ANSWER ALL QUESTIONS AND ALSO WRITE DOWN THE APPROPRIATE RULE NUMBERS.**

- 1. Division of circuits falls logically into several categories, each an individual circuit or group of circuits. List five(5) circuit groups normally selected in any installation.**

*ANS: Clause: 2.2.1.1 NOTES*

*Typically the circuit groups selected are-*

- (a) Lighting*
  - (b) Socket-outlets.*
  - © Heating and/or air conditioning appliances*
  - (d) Motor driven plant*
  - (e) Auxilliary services such as indication and control*
  - (f) safety services*
- (Any 5 carries 1 mark each)*

**(6 Marks)**

- 2. ANS: Clause: 1.4.98**

- (a) Extra-Low voltage: Not exceeding 50V a.c or 120 V ripple –free d.c*
  - (b) Low Voltage: Exceeding extra-low voltage ,but not evceeding 1000V a.c or 1500 V d.c*
- © High Voltage : Exceeding Low Voltage.*

**(4 Marks)**

- 3. Define the following terms:**

**Cable** – A single cable cord, or two or wore cable cores laid up together, either with or without fillings, reinforcements, or protective coverings..

**Circuit**– A circuit comprising live conductors, protective conductors if any ,a protective device and associated switchgear, contorlgear and accessories.

**Enclosure** – A part providing an appropriate degree of protection of equipment against external influences and against direct contact with live parts.

**(3 Marks)**

- 4. Outline the five factors to be considered when designing an electrical installation.**

*ANS: Clause: 1.6.1*

An electrical installation shall be designed to –

- (a) Protect persons, livestock and property from harmful effects:*
- (b) Function properly as intended*
- (c) Connect ,operate safely and be compatible with the electricity distribution system, or other source of supply ,to which the electrical installation is to be connected*
- (d) Minimize inconvenience in the event of a fault: and*
- (e) Facilitate safe operation, inspection, testing and maintenance.*

**(6 Marks)**

**5. What are the four (4) methods of determining the maximum demand of an installation?**

*ANS: Clause: 2.2.2*

*(a) Calculation*

*(b) Assessment.*

*© Measurement*

*(d) Limitation.*

**(5 Marks)**

**6. List three types of protective devices that can be used for the protection against both overload and short-circuit currents.**

*ANS: Clause: 2.4.3*

*(a) Circuit breakers incorporating short-circuit and overload releases.*

*(b) Circuit breaker fuse combinations.*

*© Enclosed fuse links*

**(4 Marks)**

**7. Outline four(4) situations where main switches need not be located on a switchboard.**

*ANS: Clause: 2.3.3.3*

*a) Located on public land; and*

*b) associated with telephone cabinets, traffic control signals and street furniture, such as bus shelters and the like*

*c) otherwise controlled and protected in accordance with the requirements of this standard*

*(d) Electrical installations with more than one occupier.*

**(5 Marks)**

**8. What is the maximum permissible voltage drop recommended for a low voltage installation?**

*ANS: 3.6.2*

The voltage drop should not exceed 5% of the nominal voltage

**(2 Marks)**

**9. What height above ground, floor or a suitable platform should a main switch should be located**

*ANS: Clause: 2.3.3.3.*

*Shall be not more than two meters above the ground, floor or a suitable platform.*

**(2 Marks)**

**. 10. What is the recommended size of main earthing conductor required for the following nominal sizes of active conductors?**

*ANS: Table 5.1*

*(a)  $6 \text{ mm}^2$  = earthing conductor size  $2.5 \text{ mm}^2$*

*(b)  $16 \text{ mm}^2$  - earthing conductor size  $6 \text{ mm}^2$*

**(3 Marks)**

**SECTION B**

**(60 MARKS)**

**1. Outline four advantages of alternating current over Direct current.**

**Any four.**

- (a) *Constaruction of Ac machines is much simpler than DC machines.*
- (b) *It is easier to step up or step down AC voltages with the use of transformers*
- © *Easier to change AC to DC using rectifiers.*
- (d) *Ac system provides multiphase three phase circuits for more output and load*
- (e) *AC provides Multiple Earthed Neutral System for safety.*

**(4 Marks)**

**2. What are the four basic reasons for using high voltage in transmission and distribution of electricity?**

**Any four**

- (a) Large amounts of power can be carried by transmission and distribution overhead lines-in the range of 132 kV
- (b) The line current is very much reduced due to the voltage in the overhead line.
- (c) The power loss which depends on current and line resistance is very much reduced.
- (d). The physical size of the equipment and conductors are minimized.
- (e) The fixed Tariff or initial cost of plant is low due to reduced sizes.
- (f). Easy installation and maintenance.

**(4 Marks).**

**3. Name four sources of extra low voltage supplies.**

- (a) *Generators or Alternators.*
- (b) *Step down transformers.*
- ( c) *Converters or inverters.*
- (d) *Batteries*
- (e) *Solar Cells.*

**(4 Marks)**

**4. Determine the maximum Demand current for a single phase 240V domestic supply connected with the following loads:**

- 21 lighting point**
- 6 x single 10A GPO's**
- 4 x double 10A GPO's**
- 2 X 15A socket outlet**
- 1 x 1KW range**
- 1 x 1 KW Air Conditioner**



LOAD	LOAD GROUP	CALCULATION	DEMAND CURRENT(AMPS)
21 lighting point	A(i)	3A for 1-20 points + 2A for additional 20's 21 points	5
6 x single 10A GPO's 4 x double 10A GPO's	B(i)	10A for 1-20 points + 5A for additional 20's 6+4+4 = 14 points	10
2 X 15A socket outlet	B(ii)	10A	10
1KW range	C	$1000/240 = 4.17 * 50\%$	2.08
1 KW Air Conditioner	Incl B(ii)	$1000/240 = 4.17A$	-
		<b>Maximum Demand</b>	<b>27.08 Amps</b>

5. **Electrical power is generated in many ways through different power stations in Fiji .List the names of four different types of power stations and the places they are located.**

- Hydro Electric Power Station - Monasavu
- Diesel engine power Station - Vuda, Lautoka, Nadi, Sigatoka, Rakiraki
- Steam Engine Power Station – FSC Ba, Lautoka, Rakiraki, Labasa.
- Hybrid Power Station - Nabouwalu, Butoni.

**(6 Marks)**

6. **List four advantages of extra-low voltage supplies over Low-voltage suppliers.**

- Earthing conductors are not necessary; therefore cables can be twin flex.
- Electrical shocking effect may not be significant, just a pinching effect.
- Risk of fires and other dangers are minimized
- Recommended to be used in Hazardous areas

**(4 Marks)**

7. **Name three different types of cables used in the electrical industry.**

- Steel wire armoured cables
  - Mineral Insulated metal sheathed cables
  - Thermoplastic (TPS) cables
  - Neutral screened cable
  - Oil impregnated,lead sheathed and armoured.
- (Any 4 carries 1 mark each)

**(4 Marks)**

**8. What are the three types of distribution systems commonly used?**

- (a) Overhead distribution
- (b) Underground distribution
- (c) Combined overhead and underground.

**(3 Marks)**

**9. Explain the following terms:**

- (a) Lockout- is the process of removing the source of electrical power and installing a lock which prevents the power from being turned ON
- (b)
- (c) Tagout – is the process of placing a danger tag on the source of electrical power which indicates that the equipment may not be operated until the danger tag is removed.

**(4 marks)**

**10. Outline the procedure (5 Steps) of erecting ladders.**

- (a) Select a ladder with the suitable length.
- (b) The top end of the ladder should be extended about one meter above the work place.
- © The ladder should be sloped at a ratio of 4:1
- (d) Secure the ladder properly before climbing
- (e) Make sure the base of the ladder is on a firm and level ground.

**(5 marks)**

**11. The supply should originate from Monasavu (11KV stepped up to 132KV)**

- **132 KV to be carried to Vuda (132KV stepped down to 33KV)**
- **33 KV to enter Rarawai substation where the voltage is stepped down (33KV to 11KV)**
- **This 11KV is distributed to various substations and pole top transformers.**
- **The 11 KV at FNU Ba campus steps the voltage down to 415-240 Volts.**

**(10 Marks)**

**##### END OF MARKING SCHEME #####**