Government of Western Australia
North Metropolitan TAFE

PORTFOLIO OF EVIDENCE

UEENEEG063A (SIN S7317) – Arrange circuits, control and protection for general electrical installations

Student Name:	**MARKING GUIDE**				
Class I.D:					
Portfolio Due Date:	/ /	**ASSESSMENT #**		**ATTEMPT #**	

STUDENT DECLARATION

I certify that the submitted work is my own.

Signed: _____

Assessor Feedback		
Performance demonstrated by this assessment is:	Satisfactory **(S)**	Not Yet Satisfactory **(NYS)**

Assessor Comment:

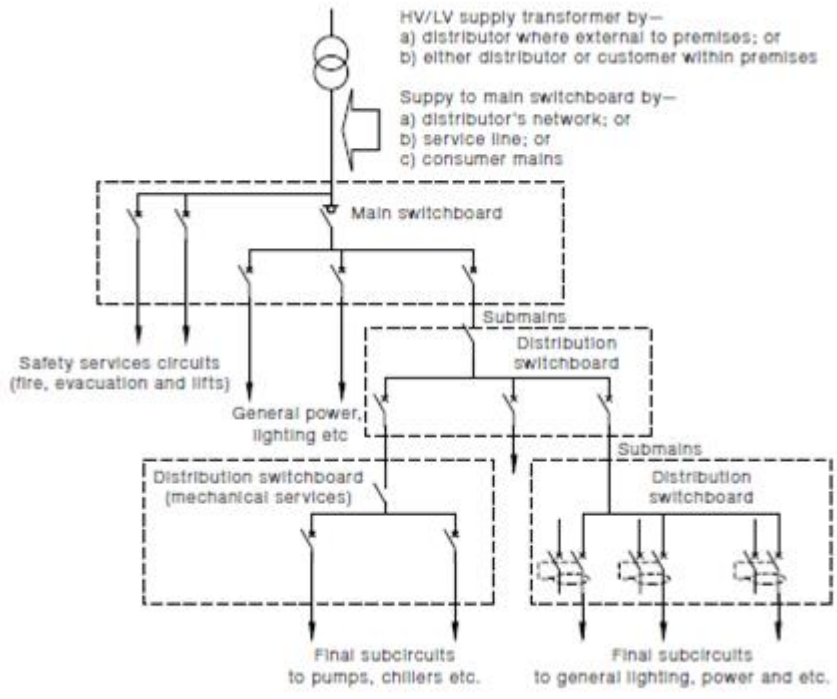
- ☐ Review all the worksheets and/or exercises.
- ☐ Attend evening tutorials.
- ☐ Join a study group.
- ☐ Apply for a retest before the end of your enrolment period.
- ☐ Other:

Notes:
1. You are allowed two assessment attempts in the enrolment period.
2. Failure to achieve a Satisfactory Result within the enrolment period will require re-enrolment.
3. You have the right to appeal your assessment result.

Assessor Name:	Assessor Signature:
Date assessment outcome and feedback received on: / /	Student Signature:

1.	Electric shock can be fatal when the value of current passing through the body exceeds		1 T3,1
	A	10A	
	B	0.01A	
	C	0.5A	
	D	0.2	
2.	How can the risk of injury from unexpected mechanical movement of electrically actuated equipment be minimised?		1 T3,3.T1,2
	A	By leaving the area	
	B	Use RCD's	
	C	Provide electrical or mechanical interlocks	
	D	Make sure the MEN system is installed correctly	
3.	Protection against the risk of ignition of flammable material due to the thermal effects of current in normal service can be minimised by		1 T3,2
	A	Providing adequate ventilation	
	B	Selecting and installing equipment with suitable temperature characteristics	
	C	Minimising the potential for arcing	
	D	All of the above	
4.	Under what condition may a person come into "indirect contact" with live parts? State the AS/NZS 3000 Clause Number.		2 T4,1
	1.4.39 **Contact with a conductive part that is not normally live but has become live under fault conditions**		
5.	Name two methods, which shall be provided for the protection against "indirect contact" with live parts. State the AS/NZS 3000 Clause Number.		3 T4,2
	1.5.5.2 **Automatic disconnection of supply** **Use of class II equipment** **Electrical separation**		

6.	Protection against indirect contact by automatic disconnection of supply in the event of a fault between a live part and an exposed conductive part shall be achieved by		1 T4,3
	A	Disconnection of the fault by a protective device	
	B	The use of a circuit breaker	
	C	A system of equipotential bonding	
	D	All of the above	
7.	The terms Touch current and Touch voltage are only used in connection with		1 T4,4
	A	Fault Protection	
	B	Maximum demand	
	C	Earthing systems	
	D	Electric fences	
8.	The current path when a short circuit fault to exposed conductive parts of an appliance occurs, is known as		1 T4,5
	A	continuity	
	B	polarity	
	C	Earth fault loop	
	D	Residual current	
9.	Protection against indirect contact can be achieved by		1 T4,6,7,8
	A	The use of class II equipment	
	B	The use of RCD's	
	C	The use of extra-low voltage	
	D	All of the above	
10.	Electrical equipment used in damp situations shall be selected and installed to		1 T4,9
	A	Operate safely in a damp environment	
	B	Provide enhanced protection against electric shock in a damp environment	
	C	Provide protection against water damage	
	D	All of the above	
11.	Protection against direct contact can be achieved by		1 T3,4,5,6
	A	Insulation	
	B	Barriers or enclosures	
	C	The use of extra-low voltage	
	D	Any/All of the above	

12.	Circuits are logically divided into several categories. The six typical circuits groups are;		6 T2,4
	a	**lighting**	
	b	**Socket-outlets**	
	c	**Heating and A/C**	
	d	**Motor driven plant**	
	e	**Auxiliary**	
	f	**Safety services**	
13.	When determining the number and type of circuits required for in an installation, you need to consider		1 T2,2
	A	The required current carrying capacity	
	B	The overcurrent requirements	
	C	The voltage drop requirements	
	D	The automatic disconnection of supply requirements	
	E	All of the above	
14.	 Above is an example of the typical circuit arrangement of an electrical installation (to three levels). State four advantages of this arrangement.		4 T2,1
	a	**One circuit only will be shut down in case of a fault**	
	b	**Location of the fault is simplified**	
	c	**Maintenance to a circuit can be performed leaving the remainder in service**	

	d	**Conductor sizes can be reduced at protective devices to suit decreasing demand**	
15.	Live parts of PELV circuits shall be protected from direct contact by; Clause 7.5.6. (a) (b)		1 T2,6
	A	Current limiting	
	B	Barriers and insulation	
	C	The use of VDR's	
	D	All of the above	
16.	Live parts of SELV circuits shall not be connected to earth or protective earthing conductors.		1
	TRUE/FALSE		T2,6
17.		Define *Isolation (Isolation function)*.	1
	Clause 1.4.75	**Function intended to cut off the supply from the whole installation or a discrete section of it, by separating it from every source of electrical energy for reasons of safety.**	T2,7
18.	In accordance with AS/NZS 3000, an electrical installation shall be designed to; **Clause 1.6.1. (a – e)**		5 T1,3
	a	**Protect persons, livestock and property from harmful effects;**	
	b	**Function correctly as intended;**	
	c	**Connect, operate safely and be compatible with distribution system;**	
	d	**Facilitate safe operation, inspection, testing and maintenance; and**	
	e	**Minimize inconvenience in the event of a fault.**	
19.	The network operator advises the prospective short circuit current (PSC) at the point of supply of a 415V 3 phase installation is 10,000A. If the impedance of the consumers mains is 0.028Ω per phase what is the PSC at the main switch board? Show all working.		2 T6,3
	Z_S =240v/10000 = 0.024Ω I = 240/(0.024+0.028) = 4,615.4A		

20.	According to AS/NZS 3000 a fault current is defined as	1 T6,1
	A current resulting from an insulation failure or from the bridging of insulation. **Clause1.4.41**	
21.	Describe the path for the circulation of fault current in the earth fault loop on an MEN system.	4 T6,2
	The active conductor **The protective earthing conductor** **The neutral-return path** **The path through the neutral point of the transformer**	
22.	According to AS/NZS 3000 what method shall be used to protect against the damaging effects of overcurrent (overload and short circuit)?	1 T6,4
	A — **Installation of current restriction device**	
	B — **The use of P.E. cells**	
	C — **A Fuse inserted on the neutral**	
	D — **Automatic disconnection of supply**	
23.	State the equations for coordination between conductors and protective devices for (a) Circuit breakers $I_B \leq I_N \leq I_Z$ **B3.2.1** b) HRC fuses. $I_B \leq I_N \leq 0.9\, I_Z$ **B3.2.2.3**	2 T6,5
24.	How may coordination of protective devices for discrimination and backup protection be achieved?	1 T6,6
	By selecting a downstream device with a time/current curve below the upstream device so that the downstream device shall operate for a given fault current and the upstream device does not operate. **Clause 2.5.7.2.1** (sensitivity)	

25	CT metering uses supply cables as primary windings and Toroidal secondary windings. What dangerous situation can arise if the CT secondary is open circuited while load current is still flowing in the primary.		1 T10,2
	A	Short circuit between primary and secondary	
	B	Flux may build up and produce dangerously high secondary voltages	
	C	Zero volts at the load	
	D	Over current at the load	
26.	Briefly explain the operating principles of a residual current device. State the AS/NZS 3000 Clause Number.		2 T7,3
	1.4.102 **A device intended to isolate supply to protected circuits, socket outlets or electrical equipment in the event of a current flow to earth that exceeds a predetermined value.**		
27.	A particular final sub-circuit is protected by a 16A Type-C circuit breaker. With reference to the tripping characteristic curve provided, determine the minimum time it would take for the circuit breaker to trip, if a fault current of 32A flowed in the circuit. (Show all working)		2 T7,4
	Ia / In = 32A /16A = 2 **From Time/Current curve = 30 seconds**		
28.	A particular final sub-circuit is protected by a 32M50 motor-rated HRC fuse. With reference to the time/current characteristic curve provided, determine how much time it would take for the fuse to interrupt the supply if a fault current of 100A flowed in the circuit.		2 T7,5
	40 seconds		
29.	When subjected to a low level overload a thermal/magnetic circuit breaker will utilise what part of its mechanism to trip?		1
	A	The bimetal strip	T7,1
	B	The solenoid	
	C	The yoke	
	D	The thermistor	

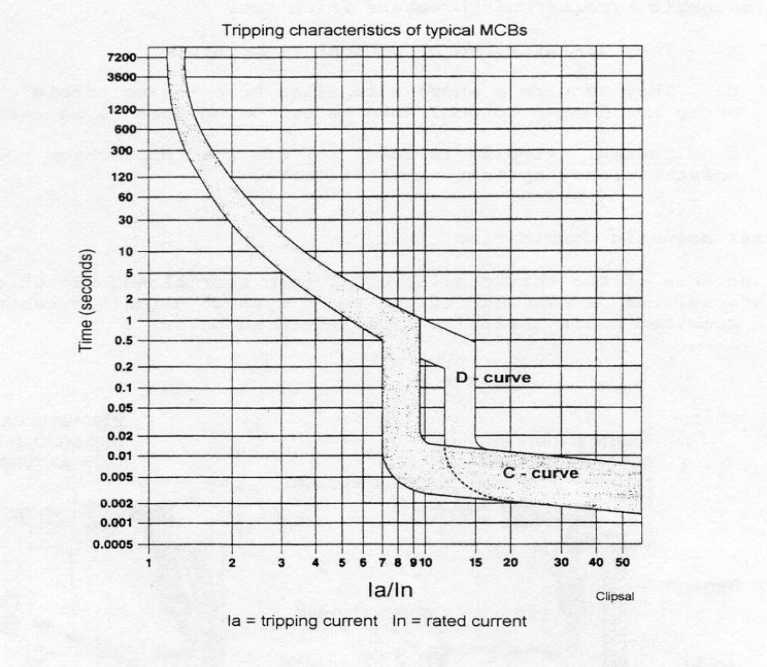
30.	'A deliberately created weak link in the circuit which open circuits due to the melting of the element by excessive current.' Describes the operating principle of;		1
	A	A Main switch	T7,2
	B	An RCD	
	C	A Fuse	
	D	A Circuit Breaker	
31.	According to AS/NZS 3760 when testing 30mA RCD using special test equipment what is the maximum allowable tripping time?		1
	A	30mS ± 8mS	T7,6
	B	300mS ± 8mS	
	C	300mS ± 0.8mS	
	D	3mS ± 80mS	
32.	What table in AS/NZS 3000 gives the maximum values of earth fault loop impedance for a given protective device rating?		1
	Table 8.1		T7,8
33.	Name two possible effects of overvoltage on an electrical system.		2
	Breakdown of electrical insulation or damage to electronic components within equipment.		T8,1
34.	Name a device which can be used to protect against the effects of overvoltage.		1
	A	PTC	T8,2
	B	VDR	
	C	LDR	
	D	NTC	

35.	What is one possible effect of under voltage in an electrical system?		1
	Motors may fail to start or take a longer time to start due to reduced torque, Lamps may dim or fail, Equipment may restart suddenly when normal voltage returns.		T8,3
36.	How can an electrical installation be protected against the effects of under voltage?		1
	A	Set the voltage slightly higher than required.	T8,4
	B	The use of non-latched Magnetic contacts	
	C	The use of Magnetic under-voltage relays	
	D	Both B and C	
37.	What is the minimum permissible sized copper main earthing conductor that can be used in an installation, if the active conductor of the consumer's mains is 16mm²?		1
	A	16mm²	T5.2
	B	6mm² (Table 5.1)	
	C	4mm²	
	D	1.5mm²	
38.	Name the six parts of an earthing system.		6
	a) Protective earthing conductors b) Main earthing conductor c) Main earth terminal d) MEN connection e) Earth electrode f) Equipotential bonding **Clause 5.3.1**		T5.3
39.	All submain and sub circuit protective earthing conductors shall be directly or indirectly connected to the main earthing conductor.		1
	TRUE/FALSE		T5.5

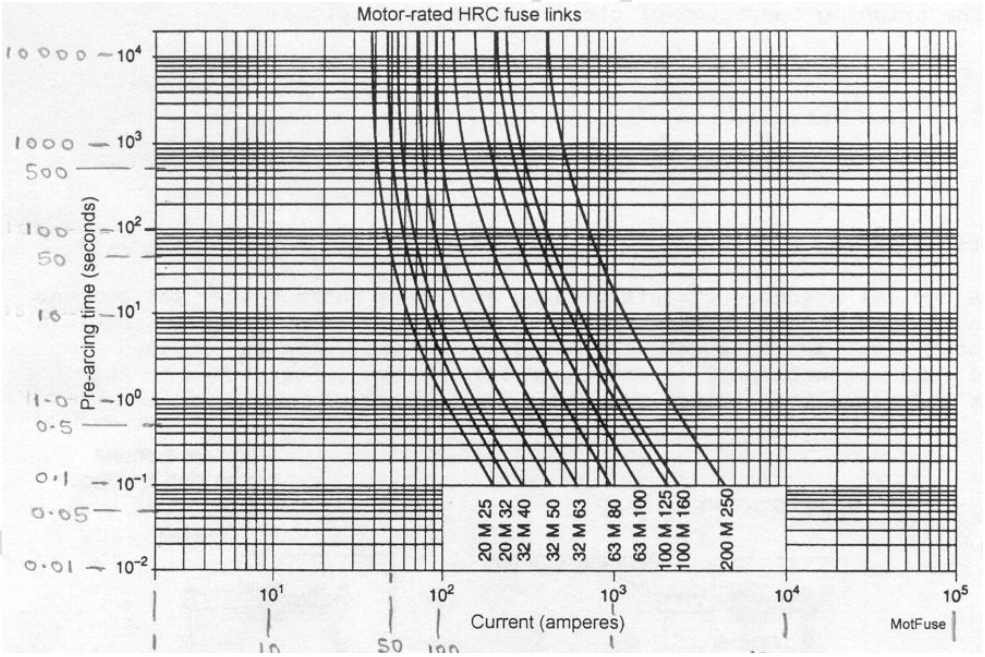
40.	Define the following terms; (according to the AS/NZS 3000) (Section1)	6
	(a)Earthed Connected to the supply neutral and general mass of earth **(b)Earth Electrode** A conductive rod or pipe that meets the standards, designed for the connection of the main earthing conductor to the general mass of earth. **(c)Equipotential Bonding** Electrical connections intended to bring exposed conductive parts or extraneous conductive parts to the same or approx. potential. **(d)Main Earth** A conductor connecting the main earthing terminal/connection or bar to the earth electrode or to the earthing system of the source of the supply. **(e)Functional Earthing** An earthing arrangement provided to ensure correct operation of electrical equipment or to permit reliable and proper functioning of electrical installations. **(f)Protective Earthing** A conductor, other than a main earthing conductor, connecting any portion of the earthing system to the portion of the electrical installation or electrical equipment required to be earthed, or to any other portion of the earthing system.	T5.1
41.	What is the general requirement of AS/NZS 3000 in relation to the accessibility of switch boards? Give the Clause number.	1
	Clause: 2.10.2.2 & 2.10.2.3 **Shall be readily Accessible, not obstructed by contents of building or fittings** **Be provided with adequate space around the switchboard on all sides where persons are to pass** **Be provided with sufficient exit facilities**	T10.4

FORMULA

$$I_{fault} = E_{phase} / (Z_1 + Z_2)$$



Typical MCB tripping characteristic curve



Typical Motor-Rated HRC Time/Current Characteristic Curves