Government of Western Australia
North Metropolitan TAFE

Assessment Tool – Portfolio Marking Guide

Qualification national code and title	**UEE30811 – Certificate III in Electrotechnology – Electrician**
Unit/s national code/s and title/s	**UEENEEG006A – Solve problems in single & three phase LV machines**

UEENEEG006A Portfolio of Evidence - Part A Transformers		**Due Date**	
Lecturer Name			
Student Name			
Student ID Number			
Telephone Contact Number		**Email:**	
By completing and submitting this signed form to my lecturer, I am stating that: **a.** The attached submission is completely my own work **b.** I understand a copy of my assessment will be kept by the NMTAFE for their records **c.** I understand my assessment may be selected for use in the NMTAFE's validation and audit process to ensure student assessment meets requirements			
Student Signature		**Date**	

Assessment Result Satisfactory / Not Yet Satisfactory *(please circle)* **Date:**_____

In order to satisfy requirements for this assessment, you need to complete the following:

Feedback to student: **Assessor please note: Where verbal clarification has been sought from a student to gather additional assessment evidence from an assessment item, question/s and response/s must be recorded, signed, and dated by the assessor, against the relevant assessment item/s.**

Student Feedback

Feedback from student:

Lecturer Signature: _____ **Student Signature:** _____

Date of feedback

Assessment Conditions:

Aids Permitted:
AS/NZS 3000:2018
Scientific Calculator
Notes:
Failure to submit a completed portfolio by the due date will result in re-enrolment

Assessment Instructions:

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1. Attempt ALL questions
2. Follow all instructions given by your assessor.
3. All diagrams must be neat and labelled.
4. All material handed in must have your full name on it.
5. All calculations and numerical answers must be shown correct to two decimal places and include both the unit of measurement and metric prefix if applicable.
6. If a question asks for a clause number from an Australian Standard, you must include the complete clause number.
7. Time allowed and aids permitted are indicated on the test paper.
8. Programmable and/or graphic calculators and phones are not permitted.
9. All bags, text books, pencil cases etc. must remain on the floor. Only the required pens, pencils, erasers, calculators are to be on the work surface.
10. Consult your assessor for assistance if required.
11. NO collaboration of any description between students.
12. You may not leave the assessment room without the assessor's permission. If you leave without your assessor's permission, your assessment attempt will be terminated and assessed as Not Yet Satisfactory.
13. Mobile phones must be Switched Off and placed in your bag for the duration of the assessment. If your mobile device is seen, 'rings' or vibrates during the assessment, your assessment attempt will be terminated and assessed as Not Yet Satisfactory.
14. If the assessment is interrupted for any reason, a new assessment will be attempted at a time determined by your assessor.
15. Verbal and written feedback will be given to you after the assessment.
16. A Formula Sheet is on the last page of this assessment.

Signing the Student Declaration on the* front *page indicates that you have read and agree to follow these instructions.

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1.	A transformer in which the windings are placed around the centre core material is called		
	A	a torroidal core type transformer	
	B	a shell core type transformer	
	C	a core type transformer	
	D	a laminated core type transformer	(1)
2.	What type of winding construction has the secondary winding wound on top of the primary winding?		
	Concentric Winding		(1)
3.	Why are transformer laminations insulated from each other?		
	To reduce eddy currents		(1)
4.	What is the reason large power transformers are placed in tanks of transformer oil?		
	A	Provide a method of making transformers portable	
	B	Improve the transformers cooling and electrical insulation	
	C	Keep contaminates out of the oil	
	D	Keep people away from the live parts	(1)
5.	What is the common name for current transformers and potential transformers connected to ammeters and voltmeters?		
	A	Instrument transformers	
	B	Isolation transformers	
	C	Double insulated transformers	
	D	Step down transformers	(1)

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6.	When testing the insulation resistance of a transformer to earth what is the minimum acceptable reading?		
	1MΩ		(1)
7.	How is the voltage in the secondary winding of a transformer formed?		
	By mutual induction		(1)
8.	Why won't transformers operate on D.C.?		
	A	They burn out due to the high heat generated by losses	
	B	There is no change in the magnetic flux of the core	
	C	The back emf equals the applied emf and no current flows in the primary	
	D	The hysteresis losses are too high	(1)
9.	A 960VA transformer has 1500 turns on the primary and 300 turns on the secondary. What is the secondary voltage and current if 240V is applied to the primary winding? **Show all working out.**		
	Vp/Vs=Np/Ns=Is/Ip (1 mark) P=I*V (1 mark) 1500/300=5 (1 mark) 960/240=4 (1 mark) 240/5=48V sec (1 mark) 4*5=20A sec (1 mark) 48V,20A		(6)
10.	When carrying out RCD testing on a portable RCD the main switchboard RCD keeps tripping. Connecting the portable RCD to what type of transformer will prevent this happening?		
	Isolating transformer		(1)

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11.	According to AS/NZS3000:2018 an autotransformer shall not be used to		(1)
	A	Supply electrical equipment that is required to be earthed	
	B	Supply electrical equipment with a voltage rating less than the highest input or output voltage of the autotransformer	
	C	Supply sub-circuits that require RCD protection	
	D	Limit the starting current of an electrical motor	
12.	What losses make up iron losses in a transformer?		(2)
	Eddy current losses and Hysteresis losses		
13.	The test used to determine the copper losses in a transformer is		(1)
	The short circuit test		
14.	What is the efficiency of a 2000VA single phase transformer if the iron losses are 50W and the copper losses are 100W? **Show all working out.**		(3)
	Eff=Pin/Pout*100% (1 mark) Eff=2000/(2000+50+100)*100% (1 mark) Eff=93% (1 mark)		
15.	The factor limiting the current rating of a transformer is		(1)
	A	The power factor of the load	
	B	The size of the transformer core	
	C	The rate at which the total heat generated is dissipated	
	D	The quality of the steel used in the core laminations	

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16.	Transformer voltage regulation is		
	A	The difference between primary voltage and secondary voltage expressed as a percentage of the primary voltage	
	B	The difference between secondary full load voltage and secondary no load voltage expressed as a percentage of the secondary full load voltage	
	C	The difference between primary full load voltage and primary no load voltage expressed as a percentage of the primary full load voltage	
	D	All of the above	(1)
17.	Due to magnetic core losses and copper losses a transformers output voltage will		
	A	Vary with load	
	B	Remain the same regardless of load	
	C	Depend on its VA rating	
	D	Depend on the duty cycle of the load	(1)
18.	If a 240V/50V step down transformer has a output voltage of 47V when full load is connected what is its voltage regulation? **Show all working out.**		
	VR = (Vnl – Vfl) / Vfl *100% (1 Mark) VR = (50 – 47) / 47 * 100% (1 Mark) VR = 6.3% (1 Mark)		(3)
19.	When testing an unmarked transformer to identify winding polarity the voltmeter reads the sum of the primary and secondary voltages. This is known as additive polarity and indicates		
	A	The voltmeter is connected between windings of the same polarity	
	B	The voltmeter is connected between windings of different polarity	
	C	The voltmeter is connected across the primary winding	
	D	The voltmeter is connected across the secondary winding	(1)
20.	Transformers may be connected in parallel because		
	A	The load has increased to greater than one transformer can supply	
	B	The demand on one transformer has increased to greater than its rating	
	C	The current required is greater than the one transformer can supply	
	D	All of these reasons	(1)

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21.	When paralleling two single phase transformers you require		
	A	The output voltages to be the same	
	B	The voltage regulation to be the same	
	C	The instantaneous voltage to be the same	
	D	All the above	(1)
22.	Refer to the wiring diagrams on page 12, identify the following transformer symbols		
	A	Autotransformer	
	B	Current transformer	
	C	Potential transformer	
	D	Double wound transformer	(4)
23.	A 2400VA step down autotransformer has a primary voltage of 240v and a secondary voltage of 200V. Calculate the current that will flow in the shared portion of the winding at full load. **Show all working out.**		
	2400 / 240 = 10A in the primary (1 Mark) 2400 / 200 = 12A in the secondary (1 Mark) 12 – 10 = 2A in the shared portion of the winding. (1 Mark)		(3)
24.	If an open circuit occurs in the shared portion of an autotransformer winding, what voltage will appear across the load?		
	The full primary line voltage		(1)
25.	According to AS/NZS 3000:2018 which three transformers do not need to comply with clauses 4.14.2 to 4.14.5?		
	An instrument transformer ELV Transformer Luminous discharge tube transformer A transformer incorporated in a motor starter		(1)

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26.	Potential transformers rated for use in circuits above 3000 volts are most often		
	A	The dry kind	
	B	Oil filled	
	C	A step up transformer	
	D	Connected to an ammeter	(1)
27.	A potential transformer has a burden of 330VA and a secondary voltage of 110V. What is the rated secondary current available for meters? **Show all working out.**		
	330 / 110 = 3A		(2)
28.	A current transformer will have		
	A	A primary with few turns and a secondary with many turns	
	B	A primary with many turns and a secondary with few turns	
	C	A primary and secondary having the same number of turns	
	D	Both the primary and secondary have few turns	(1)
29.	Current transformers are specified according to their		
	A	Rated primary current	
	B	Rated secondary current	
	C	Rated accuracy and burden	
	D	All of the above	(1)
30.	If the ammeter connected to a current transformer is removed for recalibration what must be done to the current transformer?		
	The transformer secondary shall be left short circuited		(1)

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31.	On the page 12, draw a wattmeter and an ammeter connected to a circuit by means of instrument transformers.		(2)
32.	Instrument transformers are used		
	A	Where the voltage is too high for the instrument	
	B	Where electrical isolation is required	
	C	Where the load current is above 50A	
	D	All the above	(1)
33.	Autotransformers are used		
	A	As motor starters for induction motors	
	B	As a means of isolation from the supply	
	C	To connect instruments to supplies of different ratings to the instruments	
	D	All the above	(1)
34.	In the phasor diagram on page 13, use the space provided to name the phasor quantity represented.		(2)
35.	Explain why three phase core type transformers have three legs of equal cross sectional area.		
	The fluxes produced by the windings must be the same in each leg.		(1)
36.	Why are transformer tanks often fitted with external tubes?		
	To increase the radiation area and provide a thermo-syphon circulation effect in the oil		(1)
37.	What is a Buchholz relay is used to measure?		
	A	Current in the secondary winding	
	B	Gas generated by electrical faults in the windings, tap changers or connections	
	C	Heat generated by the transformer due to losses in the core	
	D	All of the above	(1)

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38.	Tap changers are fitted to large power transformers in order to		
	A	Keep the output voltage within required limits when loads change	
	B	Minimise supply interruptions	
	C	Allow transformer oil to be sampled	
	D	All the above	(1)
39.	The terminal markings for high voltage winding on a transformer nameplate is identified by		
	Upper case letters		(1)
40.	The main disadvantage of forced draught air cooling on large transformers is		
	A	The transformer must be designed to allow easy passage of air between windings	
	B	The air needs to be cool filtered air	
	C	In the event of a fan motor failure the transformer will quickly overheat	
	D	Oil needs to be kept free of contaminants	(1)
41.	Transformer oil must have properties such as low sludge value, low acidity, high flash point, low viscosity and ……?….		
	A high dielectric strength		(1)
42.	Name three (3) contaminants transformer oil must be periodically tested for.		
	Moisture Dirt and sludge Acidity		(3)

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43.	Transformer percentage impedance can be used to		
	A	Calculate the prospective short circuit current under fault conditions	
	B	Calculate the iron loss	
	C	Calculate the copper loss	
	D	Calculate the transformer efficiency	(1)
44.	A 415V:240V 100A transformer requires 16.6V on the primary to produce the full rated current in the secondary with the secondary short circuited. What is the transformers percentage impedance? **Show all working out.**		
	Z%=Vps/Vp*100% (1 mark) Z%=16.6/415*100% (1 mark) Z%=4% (1 mark		(3)
45.	Name three (3) of the conditions required before two transformers can be connected in parallel.		
	1. Same voltage Ratio & Turns Ratio (both primary and secondary Voltage Rating is same). 2. Same Percentage Impedance and X/R ratio. 3. Identical Position of Tap changer. 4. Same KVA ratings. 5. Same Phase angle shift (vector group are same). 6. Same Frequency rating. 7. Same Polarity. 8. Same Phase sequence.		(3)
46.	When the requirements of Question 45 are not met the consequences are		
	A	High circulating currents	
	B	Harmonic distortion of the output voltages	
	C	Interference with telecommunications systems and equipment	
	D	Damage to the tertiary winding	(1)

TOTAL MARKS	SCORE	%
70		

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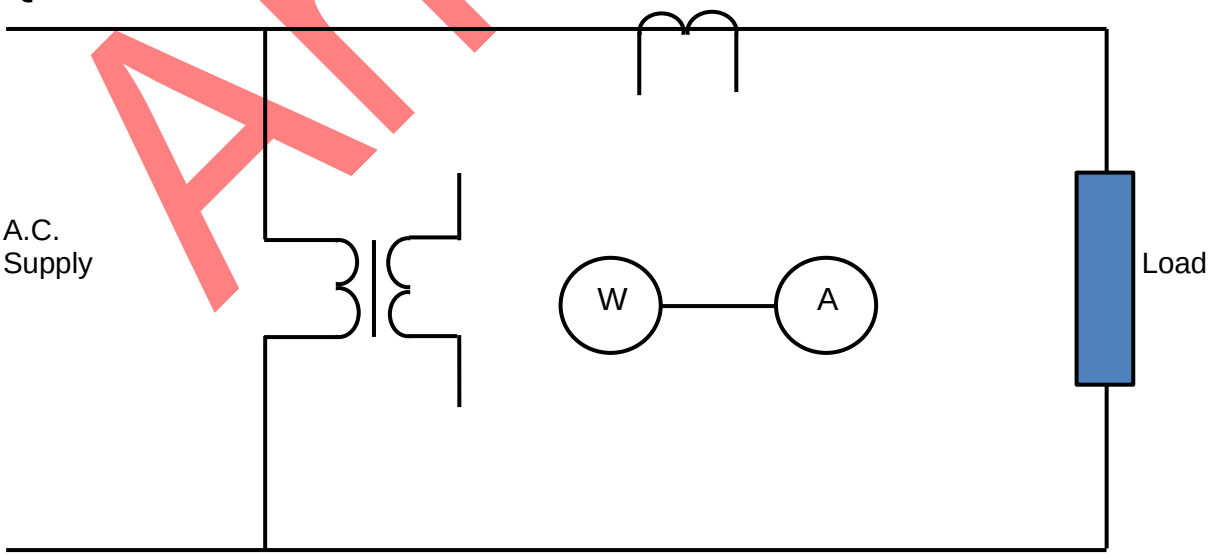
Formula	
$Voltage\ Reg = \frac{Vnl - Vfl}{Vfl} \times 100\%$	$Eff = \frac{Pout}{Pout + losses} \times 100\%$
$\frac{\boldsymbol{Vp}}{\boldsymbol{Vs}} = \frac{\boldsymbol{Np}}{\boldsymbol{Ns}} = \frac{\boldsymbol{Is}}{\boldsymbol{Ip}}$	$Fault\ VA = \frac{VA}{Z} \times 100\%$
$Isc = \frac{Fault\ VA}{\sqrt{3} \times V_L}$	$Z\% = \frac{Vps}{Vp}\ x100$

Diagrams.

Q 22.

B C A D

Q 31.



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Q 34.