GOVERNMENT OF WESTERN AUSTRALIA / TAFE WA North Metropolitan	**Portfolio of Evidence**	**Electrical Training Centre Balga Campus**

State ID: S7381	***National Id: UEENEEG101A***	***Solve problems in electromagnetic devices and related circuits***

Part A: T1 - 7

Students name	Date commenced

Students Declaration

I certify that the submitted work is my own.

Signed: .....

Performance demonstrated by this assessment is:

Satisfactory	**Not Yet Satisfactory**

Instructions for Student:

- This Portfolio of Evidence must be completed before the end of class on the third (3rd) day.
- Failure to complete these portfolios will result in a Not Yet Satisfactory **(NYS)** outcome to your assessments.

Assessors feedback to Student:

☐ Review all worksheets. ☐ Attend evening tutorials.

☐ Join a study group. ☐ Attempt a resit within 2 weeks.

☐ Other:

Note: Failure to achieve a Satisfactory result within the enrolment period will require re-enrolment.

Assessors name:	Assessors signature:
Date of assessment outcome and feedback:	Students signature:

1.	The function of a magnetic shield is to...?		T1-4
	A	Insulate the shielded object from magnetic lines of force.	
	B	Divert the magnetic lines of force around the shielded object.	
	C	Assist the magnetic lines of force to flow through the shielded object.	
	D	Help retain the magnetic strength of a permanent magnet.	
2.	If an electromagnet has 200 turns on the coil and its resistance is 5 ohms, calculate the Magnetomotive force it would produce if connected to a 25 volt supply?		T2-8
3.	Name the unit for Magnetising force		T3-11
4.	Describe the difference between magnetic leakage and magnetic fringing.		T3-14
5.	Lenz's law states that...?		T4-6
	A	The current induced into a conductor will set up a magnetic field, which will induce a voltage that opposes the incoming current.	
	B	The current through a conductor is directly proportional to the voltage and inversely proportional to the resistance.	
	C	The strength of a magnetic field decreases as the square of the distance from the conductor.	
	D	The direction of an induced current is always such as to oppose the change in the magnetic field that produced it.	
6.	Refer to Figure 3 and draw a complete Hysteresis Loop showing both good and bad materials. Indicate where to find and the values of residual magnetism and coercive force on the loop.		T3-1 T3-2
7.	List three practical applications for electromagnets.		T2-9

8.	Name three (3) factors that affect the strength of a solenoid. (3) T2-8		T2-8
	1		
	2		
	3		
9.	State Faraday's law of electromagnetic induction.		T4-1
10.	Which of the following devices is an example of electromagnetic induction?		T4-7
	A	Electro-magnets.	
	B	Contactor coil.	
	C	Relay coil.	
	D	All of the above.	
11.	The current through an inductor is reduced from 5Amps to 1 (one) 0.75 seconds. If the inductance of the coil is 1.5 henries, determine the level of the induced voltage.		T5-7
12.	Magnetic sensors can be used to detect changes in magnetic fields.		T7-6
	A	True	
	B	False	
13.	An electromagnet has 600 turns and the total reluctance of the core is 800 IN/Wb. Calculate the flux produced when 10A flows through the coil.		T3-9
14.	A coil of 800 turns has a flux of 90 µWb passing through it. If the flux is reduced to 40 µWb in 20 ms, find the average induced voltage.		T4-4

15.	A conductor is placed at right angles to a magnetic field with a density of 0.66T over a length of 0.1m of the conductor. If a current of 25 A is passed through the conductor, calculate the force exerted on the conductor.		T4-5
16.	Define the term self-inductance.		T5-6
17.	Refer to Figure 2 of a solenoid on the response sheet and show: the magnetic lines of force, the magnetic polarity (Use conventional current flow.)		T2-6 T2-7
18.	If two parallel conductors carry current in the same direction, the electromagnetic force will cause the conductors to repel each other.		T1-4
	A	True	
	B	False	
19.	Which of the following is an example of mutual inductance?		T5-10
	A	Multi-coil transformer.	
	B	Fluorescent Ballast.	
	C	Solenoid coil	
	D	All of above.	
20.	Which of the following is assigned the permeability of unity (or 1)...		T3-8
	A	Actual permeability.	
	B	Absolute permeability.	
	C	Relative permeability of air.	
	D	Permeability of iron.	
21.	If the rate at which a conductor cuts the magnetic field is reduced then...?		T4-1
	A	The magnitude of the voltage increases.	
	B	The hotter the conductors become.	
	C	The stronger the magnetic field around it.	
	D	The magnitude of the induced EMF decreases.	

22.	Which four (4) components are used in the construction of an electromagnetic relay?		T5-1
	A	Overload, Stator, Rotor, Fuses.	
	B	Fuses, Overload, Stator, Permanent magnet.	
	C	Coils, Contacts, Overloads, Permanent magnets.	
	D	Fixed iron stator, Moving iron armature, Coil, Contacts.	
23.	When applying Fleming's right hand rule for conductors carrying current, your thumb points to:		T4-2
	A	Direction of rotation.	
	B	Direction of magnetic flux.	
	C	Direction of current flow.	
	D	Points to resistance.	
24.	Which two (2) factors determine the iron losses in magnetic materials?		T3-3
	A	Voltage and Eddy current losses.	
	B	Iron and Hysteresis losses.	
	C	Hysteresis and Eddy current losses.	
	D	Copper and Brass losses.	
25.	Two (2) solutions to help reduce Hysteresis and Eddy current losses are?		T3-4
	A	Reduce the turns on the coil and change the voltage.	
	B	Create an air gap in the core and change the voltage.	
	C	Increase the turns on the coil and use a solid core.	
	D	Increase the permeability of the core material and laminate the core.	
26.	Select the correct answer that defines permeability.		T3-7
	A	The opposition to the Magnetising force.	
	B	The lines of magnetism that extend from the North pole to the South pole.	
	C	The ease at which a flux can be created in a material.	
	D	The number of lines of force per m^2.	
27.	Select the correct answer that defines magnetic flux.		T3-5
	A	The number of lines of force per m^2.	
	B	The ease at which a flux can be created in a material.	
	C	The opposition to the Magnetising force.	
	D	The lines of magnetism that extend from the North pole to the South pole.	

28.	Select the correct answer that defines flux density.		T3-10
	A	The ease at which a flux can be created in a material.	
	B	The lines of magnetism that extend from the North pole to the South pole.	
	C	The number of lines of force per m2.	
	D	The ease at which a flux can be created in a material.	
29.	Calculate the flux density of an air-cored former that has a cross sectional area of 200 mm^2 and a total magnetic flux of 0.000 0025 Webers. (note 1 mm^2 = 1x10^{-6} m^2)		T3-10
	$B = \Phi / A$		
30.	Name the common magnetic circuit types.		T3-12
	A		
	B		
31.	What is the common name for the opposition to the establishment of magnetic flux?		T3-6
32.	A conductor 0.2m in length moving at right angles to a magnetic field of flux density 0.005 T has a velocity of 20 m/s. Calculate the maximum induced voltage.		T4-3
33.	A Bifilar winding inductor is constructed by winding 2 conductors in parallel compared to an air core inductor of only 1 winding.		T5-1
	A	True	
	B	False	
34.	Refer to Figure 4 and draw lines to the correct inductor coils from the titles presented.		T5-2

35.	What four (4) factors determine the value of inductance in a coil?		T5-3
	A	Size of conductors and number of turns in coil, length of the core, cross-sectional area of core, permeability of core material.	
	B	Permeability of core, resistance of the coil, Fleming's right hand rule, length of the core.	
	C	Right hand rule for conductors, number of turns, material core made from, resistance of coil.	
	D	Capacitance in coil, amount of flux produced, length of core, and type of material coil made from.	
36.	Three (3) common types of inductor cores are.		T5-4
	A	Air, Iron, Ferrite.	
	B	Copper, Iron, Ferrite.	
	C	Iron, Air, Brass.	
	D	Iron, Aluminum, Ferrite.	
37.	Name three (3) applications for inductors in the electrotechnology field...		T5-5
	A	RF applications, Anodes, Toroidal coils.	
	B	RF applications, Diodes, DC contactors.	
	C	RF applications, Kettering ignition coils, AC contactors.	
	D	RF applications, Capacitors, Anodes.	
38.	Mutual induction occurs between coils when,		T5-8
	A	One energised coil induces an EMF into a second coil.	
	B	The coil is saturated.	
	C	The second coil is at maximum resistance.	
	D	The second coil has no load connected.	
39.	Refer to figure 5, a graph of a single D.C. circuit having inductance and fill in the missing information on the lines shown by arrows.		T5-9
40.	Snubbing circuits are fitted with components such as diodes, resistors, inductors and capacitors across the coil. These components are used to short out high self-induced voltages that try to keep the current flowing.		T5-9 T5-10
	A	True.	
	B	False.	
41.	Name one (1) undesirable effect for each self and mutual induction.		T5-11
	A	Temperature decrease.	
	B	Increased flux levels.	
	C	Decreased flux levels.	
	D	Temperature increase.	

42.	Define a time constant for an inductor connected to D.C.		T5-12
43.	The series-field windings of a 120V DC generator have an ohmic resistance of 60Ω and an inductance of 10H. Determine: (a) The time constant. (b) The time it will take for the current to attain its full value. (c) The final value of current		T5-12
44.	Name three (3) possible causes of damage to electrical instruments.		T6-6
45.	When using an ohm meter name two (2) safety precautions that should be taken.		T6-6
46.	When choosing a meter to use on 6000V which category of meter should you choose?		T6-5
	A	Cat I	
	B	Cat II	
	C	Cat III	
	D	Cat IV	
47.	When two (2) adjacent parallel conductors are carrying current in opposite directions, do they attract or repel each other?		T2-2
	A	Attract	
	B	Repel	
48.	What is the effect of an air gap in a magnetic circuit?		T3-13
	A	Decrease the reluctance of that magnetic circuit.	
	B	Increase the flux density of that magnetic circuit.	
	C	Increase the reluctance of that magnetic circuit.	
	D	Increase magnetomotive force.	

Figure 1 Question 49

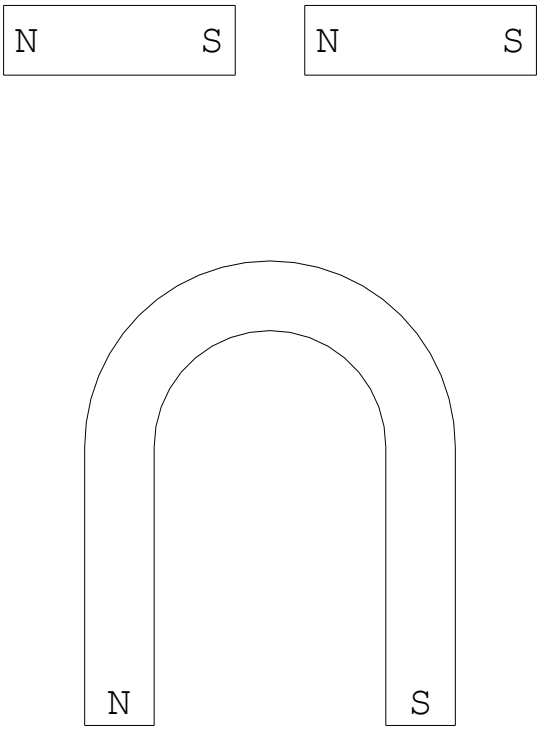


Figure 2 Question 17

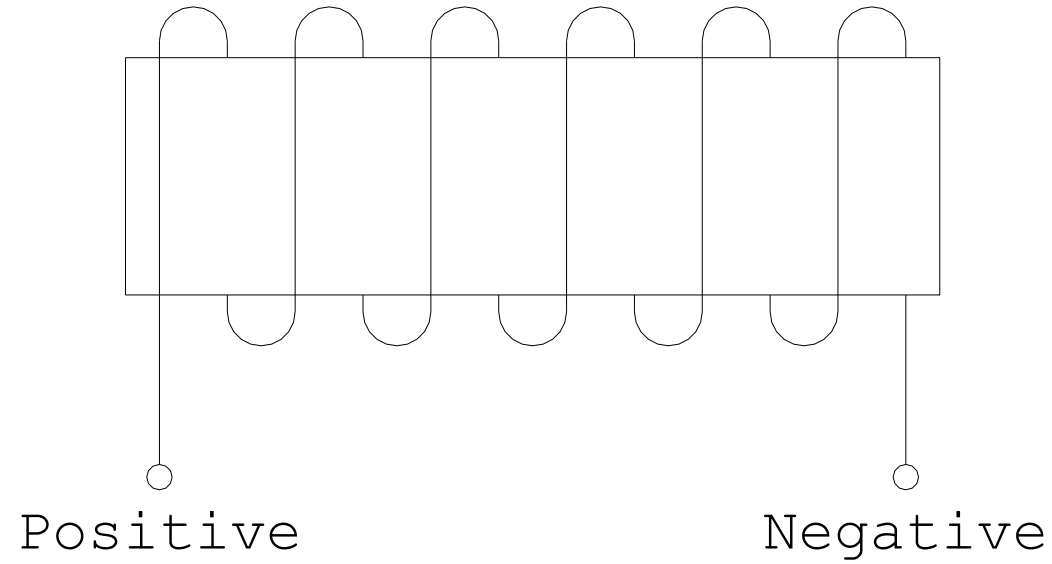


Figure 3 Question 6
Hysteresis loop

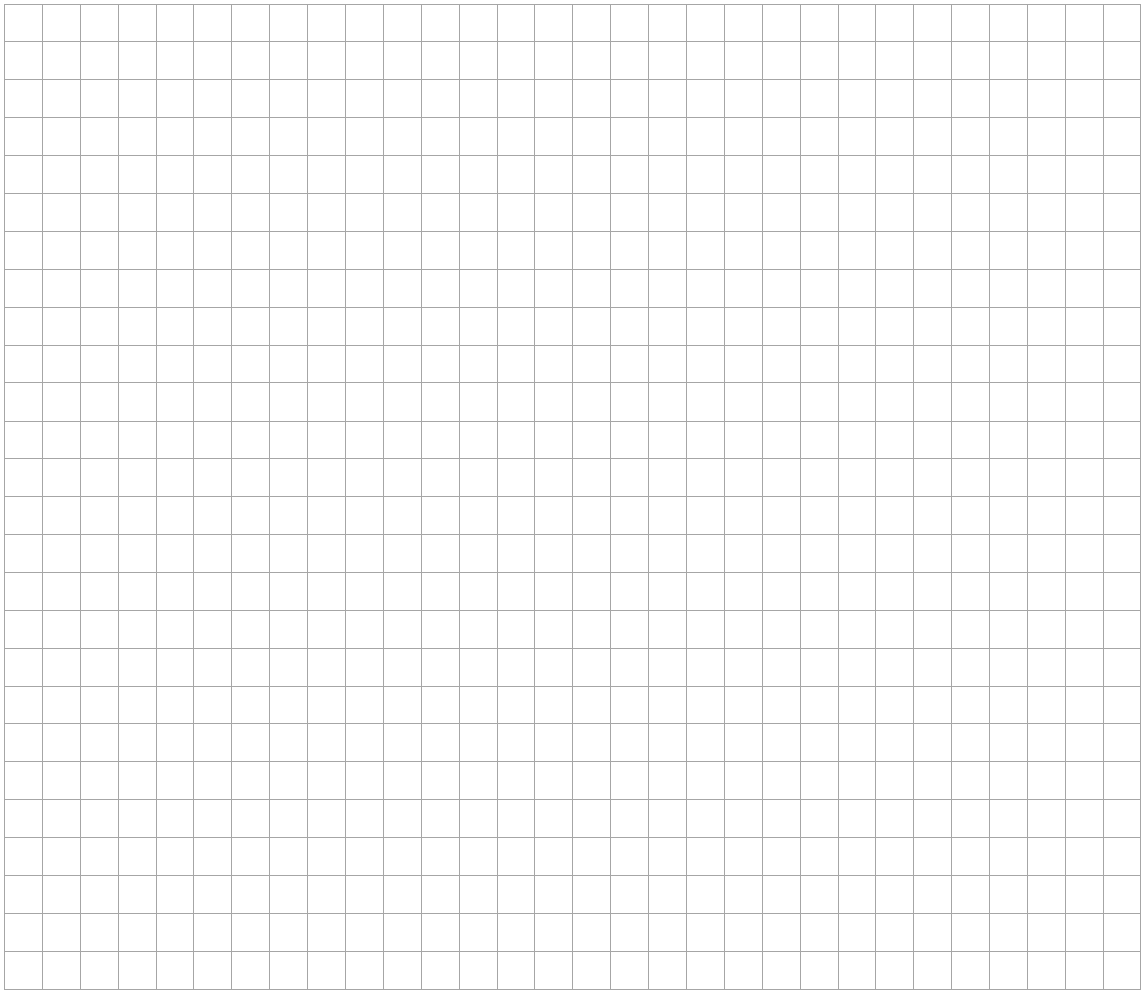
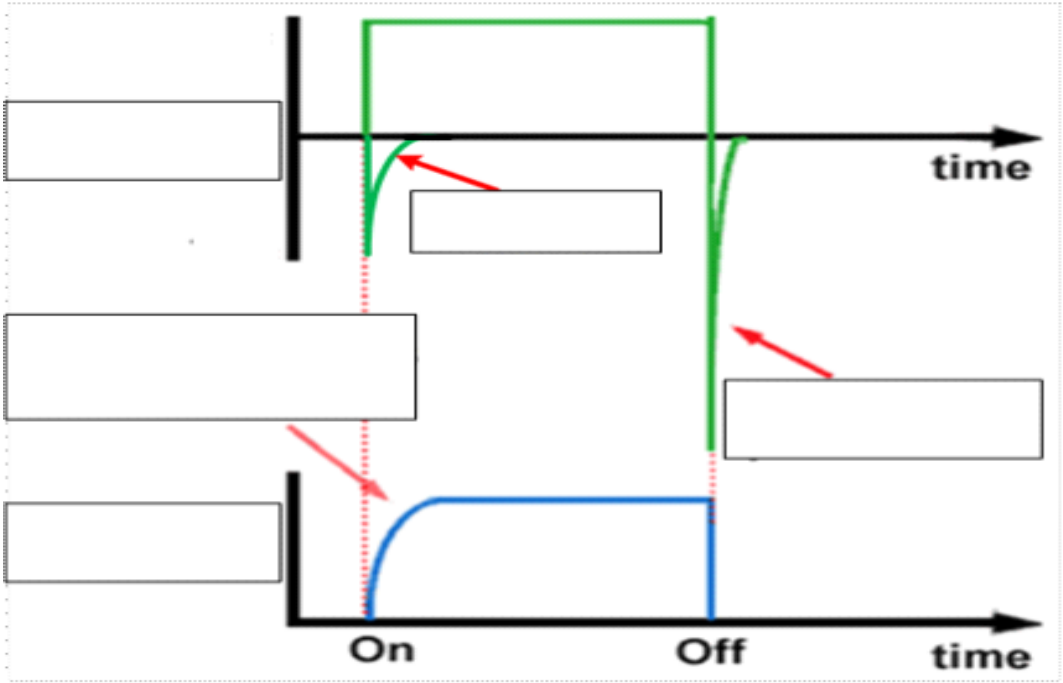


Figure 4 Question 34

1 	**1** Air Core inductor winding
2 	**2** Ferrite Core inductor winding
3 	**3** Iron Core inductor winding
4 	**4** Bifilar winding inductor

Figure 5 Question 39



FORMULA SHEET	
$F = (2 \times 10^{-7} \times I_1 \times I_2) / d$	$T = F.d$
$F = B.I.\ell$	$\emptyset = F_m / R_m$
$R_m = \ell / \mu_r \mu_o .A$	$\mu = \mu_r \mu_o$
$B = \emptyset / A$	$V = L \times \Delta I / \Delta t$
$V = N \times \Delta\emptyset / \Delta t$	$\tau = L / R$
$F_m = IN$	$V_{max} = B.\ell.v.sin\emptyset$
$H = IN / \ell$	$R_m = \ell / \mu.A$
$V_g = P.\emptyset.n.Z / a$	$R_m = IN / \emptyset$
$R_x = R1.R3 / R2$	$T = p.\emptyset.I.Z / 2\pi.a$
$F = B.I.\ell.Z / a$	$A = \ell.w$
$L = \mu.N^2.A$	$V - V_g - I_a.R_a$
$V = V_g + I_a R_a$	$F = gm$
$P = 2\pi.n.T / 60$	$Eff = (Pout / pin).100\%$