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

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

Part B: T8 -12

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 sixth (6^{th}) day.
- Failure to complete these portfolios will result in a Not Yet Satisfactory (**NYS)** outcome to your assessments.
- A pass mark of 100% must be achieved in this Portfolio of Evidence.
- Students may access their answers from any Technical or Electronic resources.

Assessors feedback to student:

☐ Review all worksheets. ☐ Attend evening tutorials.

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

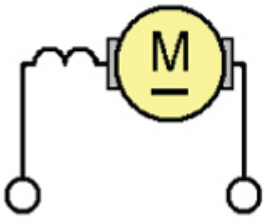
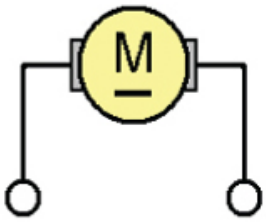
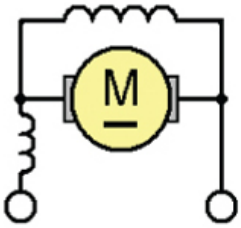
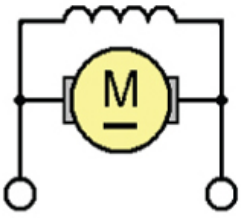
☐ Other:

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

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

1.	Name the major components of a rotating D.C. machine.		T9-1
	A	Rotor, bearings, field-poles, yoke	
	B	Yoke, end-shields with bearings, armature with commutator and brush-gear, field-poles and coils.	
	C	Yoke, end-shields, brush-gear, field-coils.	
	D	Frame, field-poles, end-shields, brush-gear.	
2.	How many current paths does an eight pole lap-wound armature have?		T9-1
	A	Two current paths.	
	B	Four current paths.	
	C	Six current paths.	
	D	Eight current paths.	
3.	The basic operating principle of any motor is:		T8-3
	A	To transform electrical energy into mechanical energy.	
	B	To transform electrical energy into potential energy.	
	C	To transform electrical energy into light energy.	
	D	To transform electrical energy into flux.	
4.	When applying Fleming's right-hand-rule for generators, your thumb will point in the direction of:		T8-2
	A	Current flow.	
	B	Field flux.	
	C	Motion.	
	D	Back EMF.	

5.	Describe the physical differences between the coils used for the series-field and the coils used for the shunt-field in a compound D.C. machine.		T9-1
	A	Shunt-fields have fewer turns of heavier gauge copper wire or bar and series-fields have many turns of finer gauge copper wire.	
	B	Shunt and series windings are the same size.	
	C	Shunt-fields have many turns of fine copper wire and series-fields have fewer turns of heavier gauge copper wire or bar.	
	D	Shunt-windings only have two paths where series-windings have more.	
6.	A 4-pole lap-wound armature contains a total of 300 effective conductors. If the magnetic flux is 0.02 webers per pole and the speed of rotation is 100 RPM, What is the value of its generated voltage?		T10-2
	A	1 V_g	
	B	0.10 V_g	
	C	10 V_g	
	D	100 V_g	
7.	What is the most likely cause of a D.C. generator failing to generate a voltage when rotated?		T10-7
	A	A loss of residual magnetism in the pole pieces.	
	B	It is not turned on.	
	C	It is burnt out.	
	D	The bearings are faulty.	
8.	Two methods used to determine losses in a D.C. machine are by measurement and by calculation.		T12-2
	A	True.	
	B	False.	
9.	What is the amount of torque developed by a motor which exerts a force of 80 N over a perpendicular distance of 200mm?		T8-5
	A	1.6 Nm	
	B	16 Nm	
	C	0.16 Nm	
	D	160 Nm	

10.	Why does the prime-mover for a D.C. generator have to work harder when the current drawn from the generator increases?				T10-9
	A	The interaction of the stronger armature flux with the field flux increases the opposing torque against the prime-mover.			
	B	The prime-mover is not large enough to do the work of driving the generator.			
	C	Because it is a series wound prime-mover.			
	D	Because the prime-mover is under-compounded.			
11.	When testing a 220v D.C. electrical motor for insulation between coils, on what setting would you set the instrument?				T9-5
	A	Ohms.			
	B	250Volts.			
	C	500 volts.			
	D	1 000 volts.			
12.	Explain the purpose of a field rheostat on a compound D.C. motor.				T11-1
	A	It is used to vary the field flux by varying the current to provide speed control.			
	B	It is used to vary the field flux in the armature.			
	C	It is used to force up the current through the armature.			
	D	It is used to force up the current through the series field.			
13.	Select the correct circuit diagram for a compound D.C. motor?				T11.5
	A		C		
	B		D		

14.	Describe the most common method used to regulate the output voltage of a D.C. generator.		T10-5
	A	Voltmeter.	
	B	Rheostat.	
	C	Adjust brushes.	
	D	Add inter-poles.	
15.	The methods used to create excitation in D.C. generators are:		T10-15
	A	By self or separate excitation.	
	B	By reversing the field or armature windings but not both.	
	C	By fitting interpoles.	
	D	By adjusting the geometric neutral plane.	
16.	How will an over-compounded generator perform under load, compared to a level-compounded generator?		T10-9
	A	The output voltage should be a little higher in an over-compounded generator than that of the level-compounded generator.	
	B	The output voltage should be much greater in an over-compounded generator than that of the level-compounded generator.	
	C	The output voltage should be greatly reduced in an over-compounded generator.	
	D	The output voltage should be the same for both types of generators.	
17.	What limits the current in a D.C. motor when it is running at normal operating speed?		T11-2
	A	The back EMF in the field windings.	
	B	The position of the brushes.	
	C	The back EMF in the armature windings.	
	D	The geometric neutral plane.	
18.	Why is it that a series motor should not be operated under ‘no-load’ conditions?		T11-11
	A	The field current increases until it trips the control devices.	
	B	The field flux is weak, allowing it to speed up to self-destruction.	
	C	The field current decreases until the motor stops.	
	D	The armature current increases and the back EMF, interacting with the field, stops the motor.	

19.	A motor with an output of 5000 watts draws 25 amps from a 220 volt supply. Calculate the motor efficiency.		T12-3
	A	Eff. = 99.9 %	
	B	Eff. = 90.9%	
	C	Eff. = 80.9%	
	D	Eff. = 95.9%	
20.	When reversing the direction of a cumulative compound motor you must:		T11-10
	A	Reverse the supply leads.	
	B	Reverse the current through the armature.	
	C	Reverse the current through the fields and the armature.	
	D	Reverse the current through the series field.	
21.	A motor has the following details on its nameplate: Power rating: 5 kW Voltage: 220 V Current: 28 A When the armature resistance is measured the result is 0.5 Ω. What is the starting current if this motor was started direct-on-line (without a starter).		T9-3
	A	400 Amps.	
	B	420 Amps.	
	C	440 Amps.	
	D	460 Amps.	
22.	Name the methods which can be used to reduce armature reaction.		T9-1
	A	By using a better type brushes and bearings.	
	B	By using inter-poles and compensating windings.	
	C	By using a smaller armature and field windings.	
	D	By changing from a long-shunt to a short-shunt field winding.	
23.	What type of Generator has no practical application?		T10-4
	A	Shunt generator.	
	B	Series generator.	
	C	Compound generator.	
	D	Permanent magnet generator.	

24.	If a generator produces a small voltage, but this voltage cannot be increased by varying the excitation, what must you do?		T10-10	
	A	Reverse the supply leads.		
	B	Reverse the field windings.		
	C	Change the bearings.		
	D	Reverse the rheostat.		
25.	Name one use for a Permanent magnet motor.		T11-4	
	A	Starter motor.		
	B	Pulse generator.		
	C	Starter motor.		
	D	Battery drills.		
26.	Which regulatory tool is used to ensure that Australians have efficient appliances and equipment?		T12-5	
	A	Minimum Energy Performance Standards.		
	B	Carbon Tax.		
	C	AS/NZS 3000:2007 Wiring Rules.		
	D	W.A.E.R.		
27.	A four pole D.C. motor has a lap-wound armature of 30 coils, each with 20 conductors. If the flux per pole is 0.02Wb and the armature current is 19 Amps, how much torque is produced?		T8-5	
	A	6.3 Nm.		
	B	16.6 Nm.		
	C	26.6 Nm.		
	D	36.3 Nm.		
28.	Which of the following is the most important safety factor associated with using rotating machinery for electricians?		T9-7	
	A	Emergency stops should be installed in close proximity to the isolator of the rotating machine.		
	B	Correct cable size must be used for all rotating machines.		
	C	The drive end of all rotating machines must be guarded.		
	D	No work shall be done on rotating machines unless the machine is locked and tagged out.		

29.	What do the fingers indicate in Fleming's left-hand motor rule?		T8-4
	A	Thumb points to pole, first finger to motion, and centre finger to voltage.	
	B	Thumb points to current, first finger to magnetic field, and centre finger to pole.	
	C	Thumb points to motion, first finger to magnetic force, and centre finger to current.	
	D	Thumb points to motion, first finger to current, and centre finger to magnetic force.	
30.	What electrical hand-held testing instrument can be used to test a D.C. armature for faults?		T9-5
	A	Voltmeter.	
	B	Ammeter.	
	C	Portable appliance tester.	
	D	Multi meter.	
31.	The basic operating principle of a generator is a single coil, rotating through a strong magnetic field, to produce an EMF.		T8-1
	A	True.	
	B	False.	
32.	The basic operation of a D.C. generator is to use mechanical energy to drive the shaft of a generator to produce electrical energy.		T10-1
	A	True.	
	B	False.	
33.	State the difference between a generator and a motor in terms of energy conversion.		T8-3 T9-2
	A	Electrical energy changed into light energy, versus light energy changed into mechanical energy.	
	B	Mechanical energy changed into electrical energy, versus electrical energy changed into vibrational energy.	
	C	Mechanical energy changed into electrical energy, versus electrical energy changed into mechanical energy.	
	D	Electrical energy changed into kinetic energy, versus kinetic energy changed into mechanical energy.	

34.	Which electrical instrument(s) can be used to compare electrical measurements with nameplate details:		T9-4
	A	Voltmeter.	
	B	Wattmeter.	
	C	Ammeter.	
	D	All of the above.	
35.	What safety measure must be undertaken before commencing work on rotating machines?		T9-6
	A	Dismantle machine.	
	B	Remove bearings.	
	C	Remove brushes.	
	D	Isolate machine.	
36.	What is the purpose of a prime-mover when related to a generator?		T10-3
	A	To cancel the residual magnetism.	
	B	To establish relative movement between the armature conductors and the field flux.	
	C	To cancel armature reaction.	
	D	To establish less torque in the armature.	
37.	The voltage and current relationships of a D.C. generator equivalent circuit are based on.		T10-6
	A	Fleming's right hand rule.	
	B	Fleming's left hand rule.	
	C	Lenz's law.	
	D	Ohms law.	
38.	The voltage in a self-excited generator may fail to build owing to:		T10-8
	A	An open circuited field winding.	
	B	The compensating winding being connected in series with the armature.	
	C	No inter-poles being connected in series with the field windings.	
	D	Too much residual magnetism in the yoke.	

39.	Four (4) safety precautions that should be observed when starting generators are:		T10-12
	A	Drive end un-guarded, off load, correct size cable used, locked and tagged out.	
	B	Drive end un-guarded, load applied, isolator fitted, properly earthed.	
	C	Drive end guarded, load applied, isolator fitted, properly earthed.	
	D	Drive end guarded, off load, isolator fitted, properly earthed.	
40.	A D.C. motor runs at 220 V, draws a current of 22 A, has a speed of 800 RPM producing a torque of 50 Nm. Calculate the output power.		T11-7
	A	41.89 Watts.	
	B	47.124 Watts.	
	C	4112.4 Watts.	
	D	4189 Watts.	
41.	Which D.C. motor has wide applications, especially within the traction industry?		T11-8
	A	Compound.	
	B	Permanent magnet.	
	C	Shunt.	
	D	Series.	
42.	What must D.C. motors have fitted to their windings to give better commutation under all loads?		T12-6
	A	Inter-poles.	
	B	Shunts.	
	C	Rheostats.	
	D	Permanent magnets.	
43.	Which of the following create losses in a D.C. machine?		T12-2
	A	Copper losses.	
	B	Iron losses.	
	C	Friction.	
	D	All of the above.	

FORMULA SHEET

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