Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2010

ELECTRICAL TECHNOLOGY MEMORANDUM

This memorandum consists of 12 pages.

QUESTION 1 TECHNOLOGY, SOCIETY AND THE ENVIRONMENT

1.1 Culture is generally the way people do things, e.g. the way we dress, communicate, etc. so the development of technology over time has drastically changed the way we dress, communicate etc. The examples can include the following:

The development of communications systems:
More people make use of mobile phones rather than the old/outdated landlines. √
Instead of writing letters, people send e-mails or text each other. √

(Alternative Answer)
Social networks such as Twitter, Facebook or MXit has changes the way we socialize with our friends.

(Any RELEVANT ANSWER WILL BE ACCEPTED) (2)

1.2 All involved people have to be trained in, amongst others:

- Experts in their technical field with good workmanship skills. √
- Good communication skills. √
- Good time management skills. √
- Good marketing skills. √
- Good financial skills. (Any acceptable answer) (Any 3) (3)

1.3 Contact √ (1)

1.4 Global warming, water and air pollution including carbon dioxide emissions. √
Caused by coal fired power station. √
Construction of dams and water ways. √ Caused during hydro-electrical power stations. √
While it is a clean source of energy environmental impact can include noise, visual pollution and an effect on birdlife. Caused by wind farm power station. (Any 2) (4)

[10]

QUESTION 2 THE TECHNOLOGICAL PROCESS

2.1 2.1.1 The designed product should meet the following requirements:

- Work with a rechargeable battery or dry cells. √
- Must be equipped with an electrical motor. √
- Must have a high efficiency, low current with maximum power. √
- Must be switched on with a motion switch.
- Must be strong and effective for the job.
- Any of the above or reasonable logical suitable specifications. (Any 3) (3)

2.1.2 Methods of collecting data:

- Interviews with involved people or people with knowledge on the specific area. √
- Observation and analysing the product in order to understand its design better. √
- Investigation and tests to determine if the project is going to work, make notes and adjust methods.
- Any relevant answer not mentioned is accepted. (Any 2) (2)

2.1.3 Any two of the following:

- Computer program (3D displays). √
- Overhead projector displays. √
- Photo copies, printed diagrams.
- Audio visual displays.
- Graphic demonstrations. (Any 2) (2)

2.1.4
- To get feedback from other learners about the artifact and how the artefact could be improved√
- Review the entire artifact with other learners√
- To make appropriate changes to the artifact√
- Make recommendation where necessary regarding changes to the artifact. (Any 3) (3)

[10]

QUESTION 3 OCCUPATIONAL HEALTH AND SAFETY ACT

3.1 Heat, √
Fuel√
Oxygen√ (3)

3.2
- The selector switch must be on correct scale. √
- Set the selector switch to the highest full-scale deflection. √
- Check whether you are going to read AC or DC.
- Plug the leads into the correct positions.
- Disconnect power on the circuit when measuring resistance.
- Check that the voltage or current to be measured does not exceed the capabilities of the meter.
- Check the polarity of the leads before connecting in the circuit. (Any 2) (2)

3.3 Use rubber hand gloves √ when assisting a person who is bleeding. √
(Any correct answer) (2)

3.4 Working on live installation. √
(Any correct answer) (1)

3.5 Exposed live conductors. √
(Any correct answer) (1)

3.6 Always clean your workstation. √
Every tool is on its place and is on its place
(Any correct answer) (1)
[10]

QUESTION 4 THREE PHASE AC GENERATION

4.1
- Three phase machine produces more power than single phase Machine of the same frame size. √
- A rotor of a three phase alternator is usually connected in star to create neutral point with which the system can be earthed to prevent floating voltages. √
- Three phase power is cheaper to generate. √ (Any 2) (2)

4.2 4.2.1 $P = \sqrt{3}\ V_L I_L \cos \emptyset$ √
$= \sqrt{3} \times 380 \times 25 \times 0,86$ √
$= 14,15$ kw √ (3)

4.2.2 $S = \sqrt{3}\ V_L I_L$ √
$= \sqrt{3} \times 380 \times 25$ √
$= 16,454$ kVA √ (3)

4.3 The CURRENT coil of the wattmeter is connected in SERIES with the load and the VOLTAGE Coil in parallel with the supply. (2)
[10]

QUESTION 5 PRINCIPLES ON AC ON RLC COMPONENTS

5.1 5.1.1 $X_L = 2\pi F L$ √
$= 2\ \pi \times 100 \times 0,3$ √
$= 188,49$ ohms √ (3)

5.1.2 $X_C = 1 / 2\pi F C$ √
$X_C = 1 / 2\pi \times 100 \times 160 \times 10^{-6}$ √
$= 9,95$ ohms √ (3)

5.1.3
$$Z = \sqrt{R^2 + (X_L - X_C)^2}\ \surd$$
$$= \sqrt{25^2 + (188,49 - 9,95)^2}\ \surd$$
$$= \sqrt{32501,53}$$
$= 180,28$ ohms √ (3)

5.1.4 $I_t = V / Z$ √
$= 150 / 180,28$ √
$= 0,83$ A √ (3)

5.1.5 $\cos \emptyset = R / Z$ √
$\emptyset = \cos^{-1} 25 / 180{,}28$ √
$\emptyset = 82{,}03°$ √ (3)

5.1.6 $Fr = 1/ 2\pi\sqrt{(LC)^2}$ √
$= 1 / 2\pi \sqrt{(0{,}3 \times 160 \times 10^{-6})^2}$√
= 3 315,73 Hz √ (3)

5.2 5.2.1 From the graph it is clear that the **Resistance** is not affected by the frequency. √√ (2)

5.2.2 **Inductive reactance** increases as the frequency increases, therefore its effect in a series circuit becomes larger with higher frequencies. √√ (2)

5.3 The circuit is inductive if $X_L > X_C$ √ and capacitive if $X_L < X_C$. √ (2)

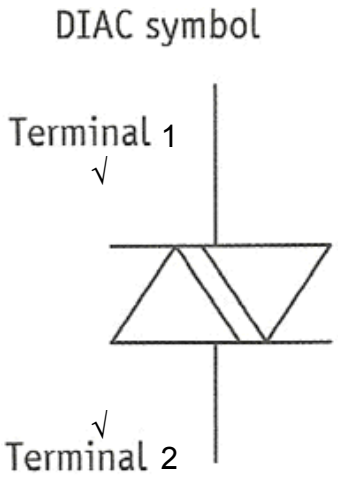
5.4 5.4.1 T√ (1)
5.4.2 F√ (1)
5.4.3 T√ (1)
5.4.4 T√ (1)
5.4.5 F√ (1)
5.4.6 F√ (1)
[30]

QUESTION 6 SWITCHING AND CONTROL

6.1
- The TRIAC has two main terminals (anodes) and a common gate. √
- It conducts in both directions. √
- It can be triggered by either a positive or negative gate pulse. √
- It can be controlled over the full cycle of 360^o√ (4)

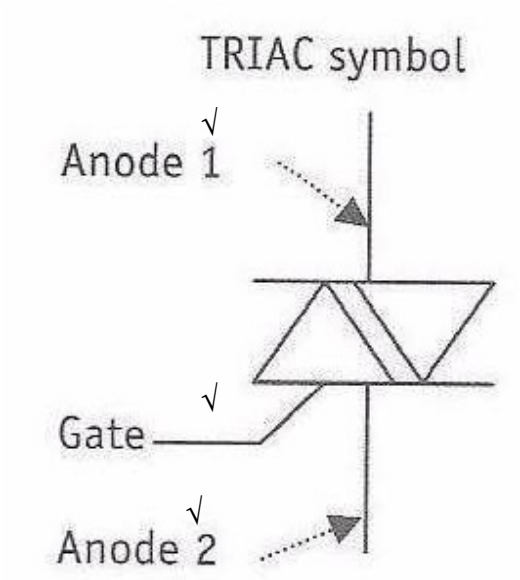
6.2
- When the voltage is applied to the DIAC, two of its internal junctions are forward biased and the third one is reverse biased√.
- Once the terminal voltage rises above V_{BO}, the third junction breaks through and the DIAC starts conducting. √
- The voltage across the DIAC now falls to a low voltage. √
- When the current through the DIAC falls below the holding current I_H, or when the terminal voltage falls to zero, the DIAC switches off and it resets√ (4)

6.3 6.3.1



(2)

6.3.2



(3)

6.4 6.4.1 F√ (1)

6.4.2 The angle from the start of a cycle to the point of triggering is called the **FIRING ANGLE** √and the angle during which the SCR is on is called the **CONDUCTION ANGLE**√. (2)

6.4.3
- The process of controlling the voltage across the load is called PHASE CONTROL. √ (1)

6.4.4
- The RC circuit trigger the signal for the SCR.
- It determines the time it takes the capacitor to √ reach the trigger voltage. √
- The RC circuit causes a phase shift between the voltage across the capacitor and the supply voltage. √ (3)

6.4.5 R_1 limits the current √ to protect the diode √ when R_2 is set at its minimum. (2)

6.4.6 When adjusting the variable Resistor R2, you can be shortening√ or increasing√ the time taken √ by the capacitor to charge through R_1 and R_2. (3)

[25]

QUESTION 7 OPERATIONAL AMPLIFIERS

7.1 7.1.1 C√ (1)
7.1.2 A√ (1)
7.1.3 B√ (1)
7.1.4 A√ (1)
7.1.5 D√ (1)

7.2 7.2.1 V_{OUT}=negative ($-V_{CC}$) √ (1)

7.2.2 V_{OUT}= positive ($+V_{CC}$) √ (1)

7.2.3 V_{OUT}= 0 V√ (1)

7.3
- Open loop voltage gain A_v = infinite. √
- Input impedance Z_{in} = infinite. √
- Output output impedance Z_{out}= zero. √
- Band-width = infinite
- Unconditional stability
- Differential inputs. That is two inputs
- Infinite common rejection (Any 3) (3)

7.4
- Amplifiers√
- Switches√
- Variable power supplies √ (3)

7.5 So that the output of the op-amp can rise and fall both above √and below √ zero. For example from +9V to -9V or vice versa. (2)

7.6
- The inverting input of an op-amp is labelled with a "–" called the inverting terminal. √
- If an input signal is fed into the op-amp's input, it will be inverted as it appears at the output. √
- The non-inverting input of the op-amp is labelled with a "+" called the non-inverting terminal. √
- As an input signal is fed into the op-amp's input, the signal will not be inverted as it appears at the output. √ (4)

7.7
- Provides control of the input and output impedance. √
- Provides control of the range of operating frequencies (band-width) of the op-amp. √
- Improves stability. (Any 2) (2)

7.8 Increasing the amplifier bandwidth
Improving the amplifier's stability
Reducing the noise produced within the amplifier
(Any 3 relevant and applicable answers) (3)

[25]

QUESTION 8 THREE-PHASE TRANSFORMERS

8.1 8.1.1 $V_L = \sqrt{3} \times V_{ph}$

$V_{ph} = V_L / \sqrt{3}$ √

$= 380 / \sqrt{3}$ √
$= 219,39$ V √ (3)

8.1.2 $V_L = V_{ph} = 4000$ V
TR = Vlp /V2p √
= 4000 / 219,39 √
= 18,23:1 √ (3)

8.2
- Star-star√
- Delta-star√
- Star-delta√
- Delta- delta (Any 3) (3)

8.3
- Copper losses √
- Iron losses √
- Stray losses √
- Magnetic losses (Any 3) (3)

8.4
- Primary and secondary coils are electrically and magnetically connected to each other and cause an insulation problem. √
- Because of lack of insulation between the primary and secondary sides their use is limited in electrical and electronic applications. √
- Because they use only one coil their impedance is low. This can lead to very high currents if the secondary side is short circuited.

(Any 2) (2)

8.5
- Air cooling method √
- Oil cooling method
- Water cooling method (Any 1) (1)

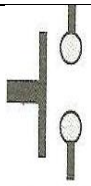
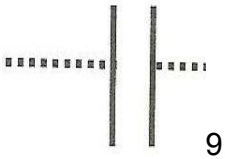
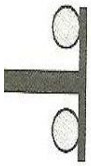
[15]

QUESTION 9 LOGIC CONCEPTS AND PLCs

9.1
- Simplified design√
- Quick delivery√
- Compact and standardized√
- Improved reliability (Any 3) (3)

9.2
- Ladder Logic (LL) √
- Instruction list (IL) √
- Logic block diagram (LBD) √ (3)

9.3

Circuit Diagram Symbol	Description	Ladder Diagram Symbol
 9.3.1	Normally open switch or other type of normally open device used as input to the PLC	 9.3.4
 9.3.2	Normally close switch or other type of normally close device used as input to the PLC	 9.3.5
 9.3.3	Relay or other type of device used as output from a PLC	 9.3.6

(6)

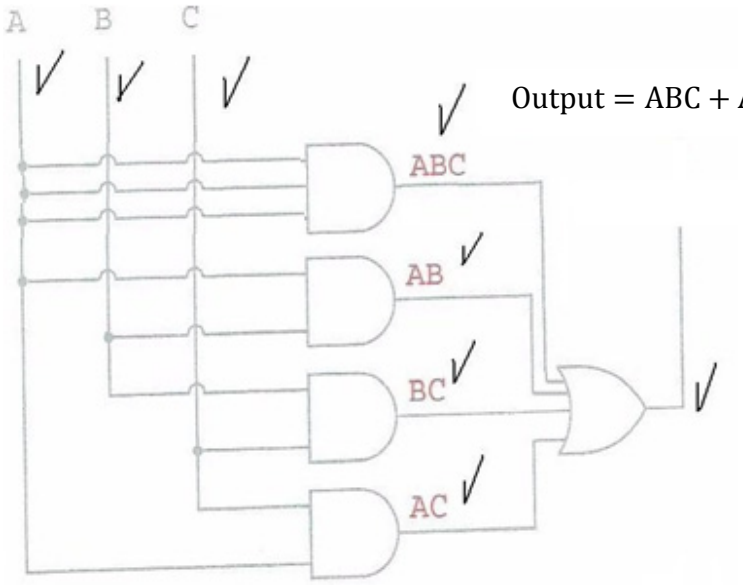
9.4

A	B	C	Output
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1 √
1	0	0	0
1	0	1	1 √
1	1	0	1 √
1	1	1	1 √

(4)

9.5 $\overline{A}BC + A\overline{B}C + AB\overline{C} + ABC = x$
$C(\overline{A}B + A\overline{B}) + A(B\overline{C} + BC) = x$
$C(1 + 1) + A(B + 1) = x$
$C + AB = x$
$A.B + C = x$ (7)

9.6 9.6.1



(8)

NOTE: We are asking learners to draw the gate network of "their "simplified Boolean expression. This means that if the gate network is correct according to their Boolean expression, we must allocate these 8 marks irrespective.

9.7 The TWO types of multivibrators are:
- Monostable√
- Astable√
- Bistable (2)

9.8
- A monostable multivibrator is a device that has only one stable. √
- An astable multivibrator is a circuit that has no stable state. √
- A bistable multivibrator is a circuit that is stable in either state. (2)

[35]

QUESTION 10 THREE PHASE MOTORS AND CONTROL

10.1 Insulation Resistance Test between Windings. √
Insulation Resistance to Earth Test. √
- Short Circuit and Open Circuit Test. √ (3)

10.2 No. of poles √
Frequency √ (2)

10.3 Swap any two of the three lines. √ (1)

10.4
- When the motor is connected to the supply, currents start flowing in the windings of the stator. √
- Owing to the phase difference of the currents, a rotating magnetic field is produced in the stator. √
- The rotating stator field cuts the static rotor conductors, inducing emfs and currents in them. √
- The currents in the rotor conductors create a magnetic field around these conductors in such a way that they try to oppose the action of the stator field. √
- Magnetic field lines around the rotor conductors weaken the stator field on one side of the conductors and strengthen the stator field on the other side of the conductors. √
- A magnetic force is exerted on the rotor conductors, pulling them in the direction of the rotating magnetic field√
- Owing to the torque on the rotor, it starts turning faster in an attempt to reach the speed of the rotating magnetic field. √
- As the motor speeds up, the torque produced balances the load and the current is just enough to keep the rotor turning. √ (8)

10.5 Lock-out switches √
Isolator √
No volt coil √
Overload coil √
Earth leakage device (Any 4) (4)

10.6
- To switch or activate the main contact. √
- For safety purpose. (Cannot restart automatically). √ (2)

10.7
- At start the motor is connected in a star mode. √
- The voltage across each phase will b e reduced. √
- This reduction in phase voltage will reduce the current in each phase. √
- As the motor speeds up and approaches full speed the starter automatically changes over into the delta mode. √
- The full line voltage is now applied to each phase. √
- With the increase voltage across each phase there is an increase in current in each phase. √ (6)

10.8
- Copper losses√
- Magnetic or iron losses√
- Mechanical losses (Any 2) (2)

10.9 The star-delta starter is used to reduce√ the starting current √ of a motor at Star to reduce unnecessary tripping. (2)

[30]

TOTAL: 200

10.8
- Koperverliese √
- Magnetiese of Ysterverliese √
- Meganiese verliese (Enige 2) (2)

10.9 Die ster-delta aansitter word gebruik om die aansitstroom √ te verminder √ van 'n motor, dit verminder onnodige kringbreker afskakeling. (2)

[30]

TOTAAL: 200

VRAAG 10 DRIE-FASE MOTORS EN BEHEER

10.1 Insolasie-weerstandtoets tussen windings. √
Isolasie-weerstand na aarde toets. √
Kortsluit en oopkring toets. √ (3)

10.2 Getal pole √
Frekwensie √ (2)

10.3 Enige twee van die drie lyne ruil. √ (1)

10.4
- Wanneer 'n motor aan die toevoer gekoppel is begin die stroom in die windings van die stator te vloei. √
- Te wyte aan die fase-verskil van die strome word 'n roterende magneetveld in die stator geproduseer. √
- Die roterende statorveld sny die statiese rotorgeleiers en induseer emks en strome daarin. √
- Die strome in die rotorgeleiers skep 'n magneetveld rondom die geleiers sodanig dat dit die aksie in die statorveld teenstaan. √
- Magneetveldlyne rondom die rotorgeleiers verswak die statorveld aan een kant van die geleiers en versterk die statorveld aan die ander kant van die geleiers. √
- 'n Magnetiese krag word op die geleiers uitgeoefen wat dit dan in die rigting van die roterende magneetveld trek. √
- Te wyte aan die torsie op die rotor, begin dit al vinniger te draai om sodoende die spoed van die magneetveld te bereik. √
- Soos die motor se spoed toeneem balanseer die wringkrag die las en stroom net genoeg om die motor aanhoudend te laat draai. √ (8)

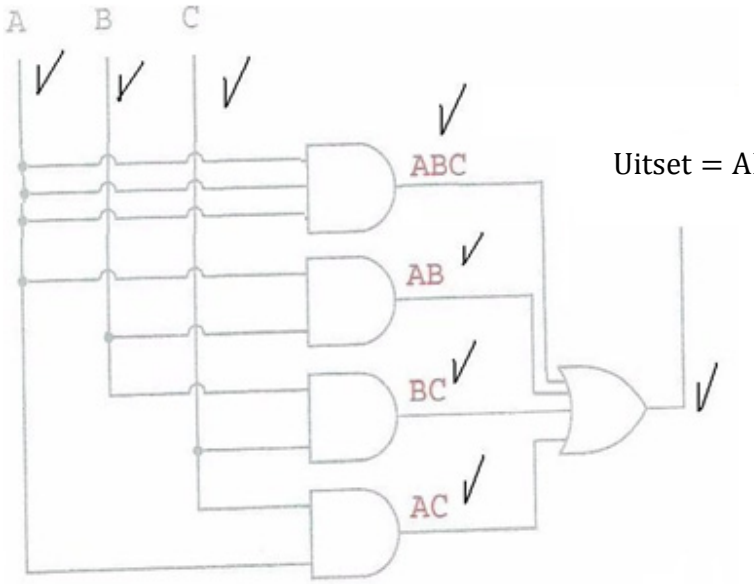
10.5 Uitsluit skakelaar √
Isolator √
Geen spanningspoel √
Oorlas spoel √
Aardlek-relê toestel (Enige 4) (4)

10.6
- Om te aktiveer of skakeling van die hoof kontaktor te bewerkstellig. √
- Vir veiligheidsredes. (Skakel nie outomaties aan nie). √ (2)

10.7
- Tydens aanskakeling word die motor se spoele in ster verbind. √
- Die spanning oor elke fase word verminder. √
- Die vermindering van fase spanning, sal mee bring dat die stroom in elke fase ook sal verminder. √
- Soos die motor versnel en naby maksimum spoed kom, sal die aansitter oorskakel na delta. √
- Die volle lynspanning word nou aangewend op elke fase. √
- Die vermeerdering van spanning oor elke fase, sal mee bring dat die stroomvloei in elke fase ook sal verhoog. √ (6)

9.5 $\overline{A}BC + A\overline{B}C + AB\overline{C} + ABC = x$
$C(\overline{A}B + A\overline{B}) + A(B\overline{C} + BC) = x$
$C(1 + 1) + A(B + 1) = x$
$C + AB = x$
$A.B + C = x$ (7)

9.6 9.6.1



$\text{Uitset} = ABC + AB + BC + AC$ (8)

LET WEL: Ons verwag van die leerling om die heknetwerk van "hulle" vereenvoudigde Boolse uitdrukking te teken. Dit beteken dus dat indien die heknetwerk korrek is volgens hulle Boolse uitdrukking dat ons die 8 punte moet toeken ongeag.

9.7 Die TWEE soorte multivibrators is:
- Monostabiel√
- Astabiel√
- Bistabiel (2)

9.8
- 'n Monostabiele vibrator is 'n gereedskapstuk met slegs een stabiel √
- 'n Astabiele vibrator is 'n kringdiagram met geen stabiel √ (2)

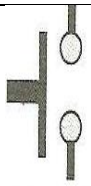
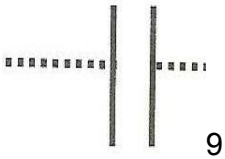
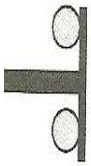
[35]

VRAAG 9 LOGIKA BEGINSELS EN PLC'e

9.1
- Vereenvoudigde ontwerp √
- Vinnige werking √
- Kompak en gestandaardiseerd √
- Verbeterde betroubaarheid (Enige 3) (3)

9.2
- Leer logika (LL) √
- Instruksie lys (IL) √
- Logiese blokdiagram (LBD) √ (3)

9.3

Kringdiagram-simbool	Beskrywing	Leërdiagram simbool
 9.3.1	Normaal oop skakelaar of ander tipe normaal oop afpraat wat gebruik word as inset by die PLC	 9.3.4
 9.3.2	Normaal geslote skakelaar of ander tipe normaal geslote apparaat wat gebruik word as inset by die PLC	 9.3.5
 9.3.3	Relê of ander tipe apparaat wat gebruik word as uitset by die PLC	 9.3.6

(6)

9.4

A	B	C	Uitset
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1 √
1	0	0	0
1	0	1	1 √
1	1	0	1 √
1	1	1	1 √

(4)

7.7
- Voorsien beheer van die inset en uitset-impedansie. √
- Voorsien beheer oor die reeks werkfrekwensies (bandwydte) van die op-versterker. √
- Bevorder stabiliteit. (Enige 2) (2)

7.8 Vergroot die bandwydte van die versterker √
Verbeter die versterker se stabiliteit √
Verminder die geraas wat in die versterker veroorsaak word. √
(Enige 3 toepaslike/relevante antwoord) (3)
[25]

VRAAG 8 DRIE-FASE TRANSFORMATORS

8.1 8.1.1 $V_L = \sqrt{3} \times V_{fs}$

$V_{fs} = V_L / \sqrt{3}$ √

$= 380 / \sqrt{3}$ √
$= 219,39$ V √ (3)

8.1.2 $V_L = V_{ph} = 4000$ V
TR = VIp /V2p √
= 4000 / 219,39 √
= 18,23:1 √ (3)

8.2
- Ster-ster √
- Delta-ster √
- Ster-delta √
- Delta-delta (Enige 3) (3)

8.3
- Koperverliese √
- Ysterverliese √
- Werwelstroom verliese √
- Diëlektriese verliese (Enige 3) (3)

8.4
- Die primêre en sekondêre is elektries en meganies aanmekaar verbind, dit veroorsaak 'n isolasie probleem. √
- Omdat daar 'n isolasie probleem bestaan tussen die primêre en sekondêre spoele, is die gebruike van die transformator beperk in elektriese en elektroniese toepassings. √
- Omdat hulle slegs een spoel het, is die impedansie laag. Dit kan lei tot baie hoë strome as die sekondêre kant gekortsluit word. (Enige 2) (2)

8.5
- Lugverkoeling √
- Olieverkoeling
- Waterverkoeling (Enige 1) (1)

[15]

6.4.5 R_1 beperk die stroom √ om die diode te beskerm, √ sodra R_2 op sy minimum gestel word. (2)

6.4.6 Sodra die verstelbare weerstand R_2 gestel word, kan jy die tyd √ wat dit neem vir die kapasitor om te laai deur R_1 en R_2 te laai, verkort √ of verleng. √ (3)

[25]

VRAAG 7 OPERASIONELE VERSTERKERS

7.1 7.1.1 C √ (1)
7.1.2 A √ (1)
7.1.3 B √ (1)
7.1.4 A √ (1)
7.1.5 D √ (1)

7.2 7.2.1 V_{UIT}=negatief ($-V_{CC}$) √ (1)

7.2.2 V_{UIT} = positief ($+V_{CC}$) √ (1)

7.2.3 V_{UIT} = 0 V √ (1)

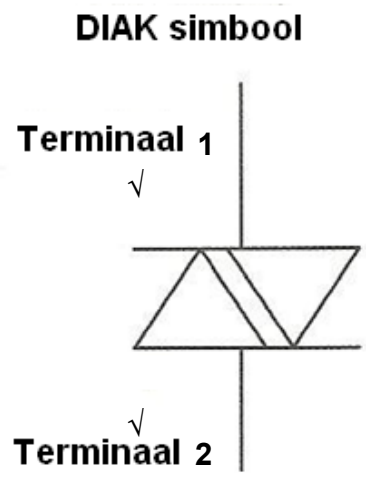
7.3
- Oop-lus spannings wins A_v = oneindig. √
- Inset impedansie Z_{in} = oneindig. √
- Uitset impedansie Z_{uit} = nul. √
- Band wydte = oneindig.
- Onvoorwaardelike stabiliteit.
- Differensiale insette. Dit is twee insette.
- Oneindige gemeenskaplike verwerping. (Enige 3) (3)

7.4
- Versterkers √
- Skakelaars √
- Verstelbare kragbronne √ (3)

7.5 Sodat die uitset van die op-versterker kan styg en daal, bo √ en onder √ nul waarde. Byvoorbeeld vanaf +9V tot -9V en omgekeerd. (2)

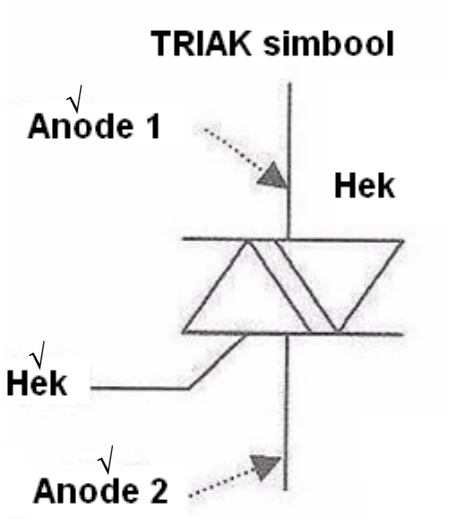
7.6
- Die omkeer inset van die op-versterker is gemerk met ’n “-” genoem omkeer terminaal. √
- As die inset sein van die op-versterker se inset, sal dit omgekeer word soos dit by die uitset verskyn. √
- Die nie-omkeer inset van die op- versterker word gemerk as “+” en word genoem die nie-omkeer inset terminaal. √
- Sodra ’n sein op hierdie terminaal van die op-versterker ingevoer word, sal die sein nie omgekeer wees by die uitset. √ (4)

6.3 6.3.1



(2)

6.3.2



(3)

6.4 6.4.1 V √ (1)

6.4.2 Die hoek vanaf die begin van die siklus tot by snellering word die **SNELLERHOEK** √ en die hoek terwyl dit aan is, word die **GELEIDINGSHOEK** genoem √. (2)

6.4.3
- Die proses van beheer van die spanning oor die las, word FASE BEHEER genoem. √ (1)

6.4.4
- Die RC-kring sneller die SBG.
- Dit bepaal die tyd wat dit sal neem vir die kapasitor √ om die sneller spanning te bereik. √
- Die RC-kring veroorsaak 'n fase verskuiwing tussen die spanning oor die kapasitor en die voorsieningspanning. √ (3)

5.1.5 $\cos Ø = R / Z$ √
$Ø = \cos^{-1} 25 / 180,28$ √
$Ø = 82,03°$ √ (3)

5.1.6 $Fr = 1/ 2\pi\sqrt{(LC)^2}$ √
$= 1 / 2\pi \sqrt{(0,3 \times 160 \times 10^{-6})^2}$√
= 3 315,73 Hz √ (3)

5.2 5.2.1 Van die grafiek is dit duidelik dat die **Weerstand** nie geaffekteer √ is deur die frekwensie nie. √ (2)

5.2.2 **Induktiewe reaktansie** vermeerder √ as die frekwensie vermeerder, daarom is die effek in 'n serie kring hoër met hoër frekwensies. √ (2)

5.3 Die kring is induktief as $X_L > X_C$ √ en kapasitief as $X_L < X_C$. √ (2)

5.4 5.4.1 W √ (1)
5.4.2 V √ (1)
5.4.3 W √ (1)
5.4.4 W √ (1)
5.4.5 V √ (1)
5.4.6 V √ (1)
[30]

VRAAG 6 SKAKEL EN BEHEER

6.1
- Die TRIAC het twee hoof terminale (anodes) en 'n gemeenskaplike hek. √
- Dit gelei in beide rigtings. √
- Dit kan gesneller word deur of 'n negatiewe of positiewe puls op die hek.√
- Dit kan beheer word oor die hele siklus van 360^o √ (4)

6.2
- As die spanning gekoppel word aan 'n DIAK, sal twee van die voegvlakke mee voorgespan wees en die derde teen voorgespan wees.√
- Sodra die terminaalspanning styg tot bo V_{BO}, sal die derde voegvlak deur breek en die DIAK sal begin gelei. √
- Die spanning oor die DIAK sal verlaag. √
- Sodra die stroomvloei deur die DIAK verminder tot onder die hou stroom I_H of die terminaal spanning word nul, sal die DIAK afskakel en herstel √ (4)

3.6 Ruim altyd jou werkstasie op. √
Elke stuk gereedskap het 'n plek en is op sy plek.
(Enige korrekte antwoord) (1)
[10]

VRAAG 4 DRIE-FASE KRAG-OPWEKKING

4.1
- Drie-fase masjiene produseer meer krag as enkel-fase masjiene van dieselfde raamgrootte. √
- Die rotor van 'n drie-fase alternator is gewoonlik verbind in ster om 'n neutrale punt te voorsien wat aan die aarde gekoppel word, om drywende spannings te voorkom. √
- Drie-fase krag is goedkoper om te genereer. (Enige 2) (2)

4.2 4.2.1 $P = \sqrt{3}\ V_L I_L \cos \varnothing$ √
$= \sqrt{3} \times 380 \times 25 \times 0,86$ √
$= 14,15$ kw √ (3)

4.2.2 $S = \sqrt{3}\ V_L I_L$ √
$= \sqrt{3} \times 380 \times 25$ √
$= 16,454$ kVA √ (3)

4.3 Die STROOMklos van die wattmeter is in serie met die las en die SPANNINGklos in parallel met die toevoer geskakel. (2)
[10]

VRAAG 5 BEGINSELS VAN WS OP RLC-KOMPONENTE

5.1 5.1.1 $X_L = 2\pi F L$ √
$= 2\ \pi \times 100 \times 0,3$ √
$= 188,49$ ohms √ (3)

5.1.2 $X_C = 1 / 2\pi F C$ √
$X_C = 1 / 2\pi \times 100 \times 160 \times 10^{-6}$ √
$= 9,95$ ohms √ (3)

5.1.3
$$Z = \sqrt{R^2 + (X_L - X_C)^2}\ \surd$$
$$= \sqrt{25^2 + (188,49 - 9,95)^2}\ \surd$$
$$= \sqrt{32501,53}$$
$= 180,28$ ohms √ (3)

5.1.4 $I_t = V / Z$ √
$= 150 / 180,28$ √
$= 0,83$ A √ (3)

2.1.2 Metodes van data-versameling:
- Onderhoude met die betrokke mense of mense met kennis op die gebied. √
- Waarneming en analisering van die produk om die ontwerp beter te verstaan. √
- Ondersoek en toetse om vas te stel of die projek werk, maak van notas en pas metodes aan.
- Enige relevante antwoord wat nie genoem is nie kan aanvaar word. (Enige 2) (2)

2.1.3 Enige twee van die volgende:
- Rekenaar program (3D vertoon). √
- Oorhoofse projektor vertoon. √
- Foto afskrifte, gedrukte diagramme.
- Oudiovisuele vertoon.
- Grafiese demonstrasies. (Enige 2) (2)

2.1.4
- Om terugvoer te kry van ander leerders oor die artefakte/produk en hoe dit verbeter kan word. √
- Hersien die hele artefakte met ander leerders √
- Om noodsaaklike veranderings aan die artefakte aan te bring.√
- Maak aanbevelings waar nodig met betrekking tot veranderings aan die artefakte. (Enige 3) (3)

[10]

VRAAG 3 BEROEPSVEILIGHEID EN GESONDHEIDSWET

3.1 Hitte, √
Brandstof √
Suurstof √ (3)

3.2
- Die selekteerskakelaar moet op die regte skaal wees. √
- Stel die selekteerskakelaar op die hoogste volskaalse defleksie. √
- Maak seker of jy Ws- of Gs-lesings sal lees.
- Koppel die terminale aan die korrekte posisies.
- Ontkoppel kragvoorsiening van kring voordat weerstand lesings geneem word.
- Maak seker dat die spanning en stroom wat gemeet word nie die meter se vermoë oorskry nie.
- Maak seker van die polariteite van jou terminale voordat jy dit op die kring koppel. (Enige 2) (2)

3.3 Gebruik rubberhandskoene √ as jy 'n persoon wat bloei bystaan. √
(Enige korrekte antwoord) (2)

3.4 Werk op lewendige installasies. √
(Enige korrekte antwoord) (1)

3.5 Blootgestelde lewendige geleiers. √
(Enige korrekte antwoord) (1)

VRAAG 1 TEGNOLOGIE, GEMEENSKAP EN OMGEWING

1.1 Kultuur is gewoonlik die wyse waarop mense dinge doen, byvoorbeeld hoe jy aantrek, kommunikeer, ens. Die ontwikkeling van tegnologie het oor die jare baie verander soos byvoorbeeld jou kleredrag, die wyse van kommunikasie, ens. Voorbeelde kan die volgende insluit:

Die ontwikkeling van telekommunikasie-stelsels

Meer mense gebruik selfone instede van die argaïese landlyne √
Mense skryf nie meer briewe nie, maar stuur eerder e-pos of sms'e

(Alternatiewe Antwoord)
Sosiale netwerke soos Twitter, Facebook en MXit het die wyse waarop vriende met mekaar sosialiseer verander

(ENIGE RELEVANTE ANTWOORD SAL AANVAAR WORD) (2)

1.2 Alle betrokke persone moet opgelei wees in onder andere:

- Deskundiges in hulle tegniese veld met goeie werksvaardighede. √
- Goeie kommunikasie-vaardighede. √
- Goeie tydsbestuursvaardighede. √
- Goeie bemarkingsvaardighede.
- Goeie finansiële vaardighede.(Enige aanvaarbare antwoord)(Enige 3) (3)

1.3 Kontak √ (1)

1.4 Globale verwarming, water- en lug besoedeling ingesluit koolstofdioksied vrystelling. √
Veroorsaak deur steenkool kragstasies. √
Konstruksie van damme en watergange. √ Veroorsaak deur hidroëlektriese kragstasies. √
Hoewel dit 'n skoon bron van energie is, het dit nog 'n omgewingsinvloed, soos geraas, visuele besoedeling en 'n invloed op voël lewe veroorsaak deur wind aangedrewe kragstasies. (Enige 2) (4)

[10]

VRAAG 2 DIE TEGNOLOGIESE PROSES

2.1 2.1.1 Die ontwerpte produk moet aan die volgende vereistes voldoen:

- Werk met 'n herlaaibare batterye of droë selle. √
- Moet toegerus wees met 'n elektriese motor. √
- Moet 'n hoë rendement , lae stroom met maksimum krag hê. √
- Moet aanskakel met 'n beweegbare skakelaar.
- Moet sterk en effektief wees vir die taak.
- Enige van die bogenoemde of redelike logiese toepaslike spesifikasies. (Enige 3) (3)

Province of the
EASTERN CAPE
EDUCATION

NASIONALE SENIOR SERTIFIKAAT

GRAAD 12

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ELEKTRIESE TEGNOLOGIE MEMORANDUM

Hierdie memorandum bestaan uit 12 bladsye.