



# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## NATIONAL SENIOR CERTIFICATE

**GRADE 12**

**ELECTRICAL TECHNOLOGY**

**FEBRUARY/MARCH 2012**

**MARKS: 200**

**TIME: 3 hours**



**This question paper consists of 12 pages and 1 formula sheet.**



**INSTRUCTIONS AND INFORMATION**

1. Answer ALL the questions.
2. Sketches and diagrams must be large, neat and fully labelled.
3. Show ALL calculations, correctly rounded off to TWO decimal places.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Non-programmable calculators may be used.
6. Show the unit for all answers of calculations.
7. A formula sheet is provided at the end of this question paper.
8. Write neatly and legibly.



**QUESTION 1: TECHNOLOGY, SOCIETY AND ENVIRONMENT**

- 1.1 Describe why it is neither ethical nor legal to expect a person to work on electrical equipment without the required training. (3)
- 1.2 When an entrepreneur wishes to promote a new product, he must firstly do market research. Give TWO reasons why, and describe why they are important. (4)
- 1.3 Global warming is creating a huge negative impact on our society and environment. List THREE suitable energy sources that have little negative impact on the environment. (3)  
**[10]**

**QUESTION 2: TECHNOLOGICAL PROCESS**

- 2.1 With reference to the design problem in your PAT project, name THREE of the technological steps that must be followed. (3)
- 2.2 Give THREE reasons why it is important to follow the technological process in the completion of an artefact/project. (3)
- 2.3 The design of the circuit board used in your PAT is important. Describe, giving TWO reasons why this is important. (4)  
**[10]**

**QUESTION 3: OCCUPATIONAL HEALTH AND SAFETY**

- 3.1 State why it is dangerous to use water to extinguish an electrical fire. (2)
- 3.2 Explain why it is important to have the correct level of lighting in an electrical technology workshop. (2)
- 3.3 Name TWO ways in which HIV/Aids can be transmitted between humans. (2)
- 3.4 Describe how an earth-leakage unit can protect a person from electrical shock when using a faulty electrical appliance. (2)
- 3.5 Name ONE essential piece of safety equipment that must be used when working with a grinding machine. (1)
- 3.6 Give ONE reason why it is important to maintain tools in a good condition. (1)  
**[10]**



**QUESTION 4: THREE-PHASE AC GENERATION**

- 4.1 Name TWO advantages of a three-phase system in comparison with a single-phase system. (2)
- 4.2 Power distribution to all consumers is done in the star connection. Explain why. (2)
- 4.3 A three-phase balanced load is connected in delta across a 380 V supply. The load current is 5 A with a power factor of 0,9.

Given:

$$\begin{aligned}V_L &= 380 \text{ V} \\I_L &= 5 \text{ A} \\ \cos\theta &= 0,9\end{aligned}$$

Calculate the following:

- 4.3.1 The current in each phase of the load (3)
- 4.3.2 The total power dissipated by the load (3)
- [10]**

**QUESTION 5: RLC CIRCUITS**

- 5.1 What will happen to the brightness of an incandescent lamp, connected in series with an RC circuit, if the frequency of the supply is decreased? (1)
- 5.2 Name ONE disadvantage of a poor power factor. (1)
- 5.3 A capacitor with a capacitive reactance of 250  $\Omega$ , an inductor with an inductive reactance of 300  $\Omega$  and a resistor with a resistance of 500  $\Omega$  are all connected in series to a 220 V/50 Hz supply.

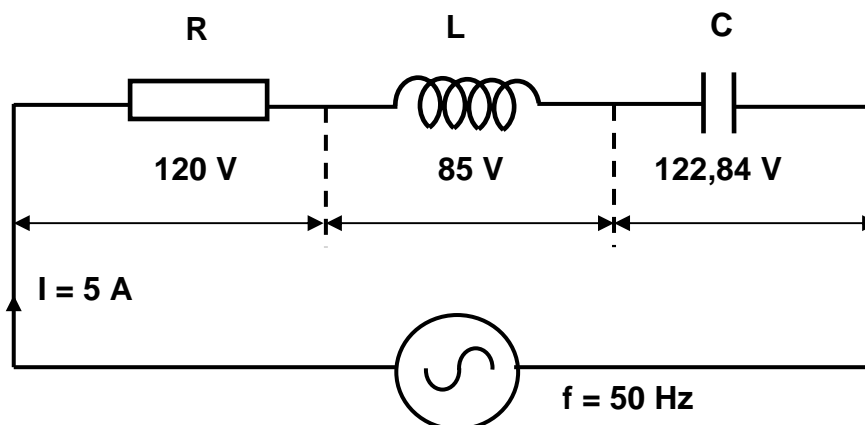
Given:

$$\begin{aligned}X_C &= 250 \text{ } \Omega \\X_L &= 300 \text{ } \Omega \\R &= 500 \text{ } \Omega \\V_S &= 220 \text{ V} \\f &= 50 \text{ Hz}\end{aligned}$$

- 5.3.1 Draw a labelled circuit diagram. (4)
- 5.3.2 Calculate the total impedance of the circuit. (3)
- 5.3.3 Calculate the power factor of the circuit and state whether it is leading or lagging. (4)



5.4 Refer to the circuit in FIGURE 5.1.



**FIGURE 5.1: RLC SERIES CIRCUIT**

Given:

$$V_R = 120 \text{ V}$$

$$V_L = 85 \text{ V}$$

$$V_C = 122,84 \text{ V}$$

$$I_S = 5 \text{ A}$$

$$f = 50 \text{ Hz}$$

Calculate the following:

5.4.1 The supply voltage (3)

5.4.2 The inductive reactance of the inductor (3)

5.4.3 The capacitive reactance the capacitor (3)

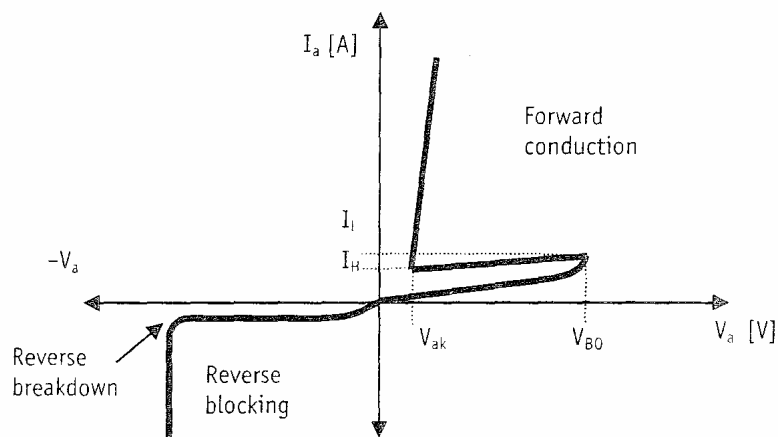
5.4.4 The capacitance of the capacitor (3)

5.4.5 Draw the phasor diagram of the circuit. Indicate the direction of rotation. (5)

**[30]**

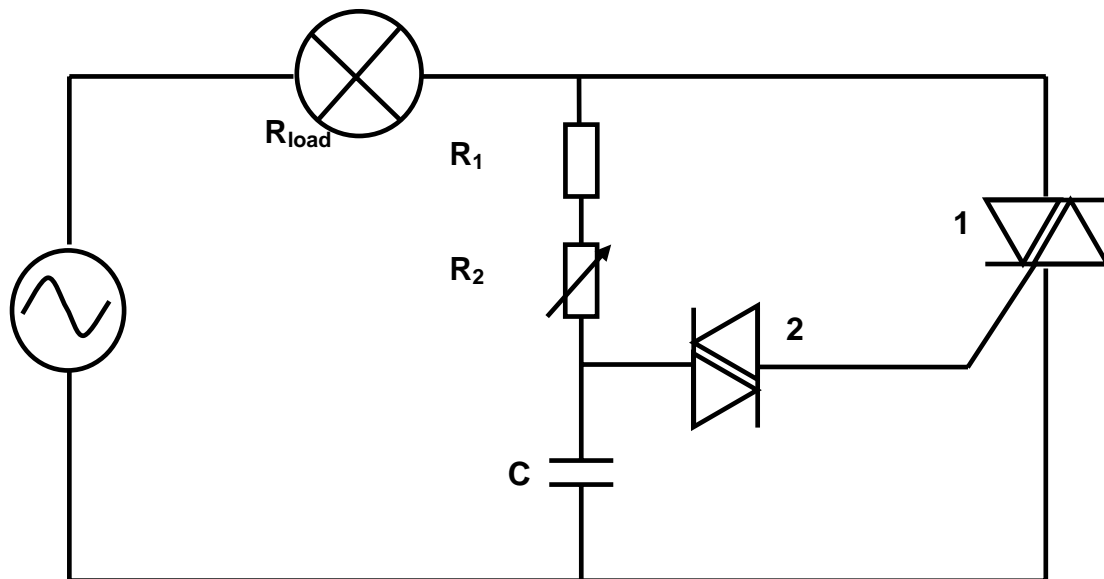
**QUESTION 6: SWITCHING AND CONTROL CIRCUITS**

- 6.1 Draw a fully labelled symbol of an SCR. (3)
- 6.2 Describe ONE method to switch an SCR on. (3)
- 6.3 The diagram in FIGURE 6.1 is the characteristic curve of an SCR. With reference to FIGURE 6.1, answer the following questions:

**FIGURE 6.1: CHARACTERISTIC CURVE OF AN SCR**

- 6.3.1 Explain what occurs at reverse breakdown voltage (3)
- 6.3.2 When the SCR is conducting (refer to FIGURE 6.1), what would the voltage drop across the SCR be? (1)
- 6.3.3 When the SCR is conducting, describe what determines the current flow through the SCR. (2)
- 6.3.4 If the current flowing through the SCR drops below  $I_H$ , what will occur? (2)

- 6.4 The lamp-dimming circuit in FIGURE 6.2 is connected to a 220 V/50 Hz supply.

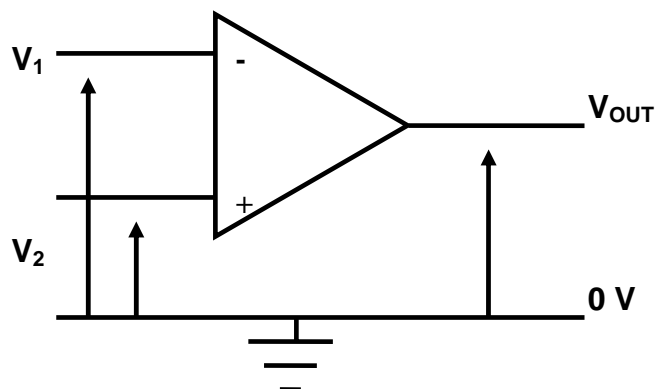


**FIGURE 6.2: LAMP-DIMMING CIRCUIT**

- 6.4.1 Name the components marked 1 and 2. (2)
- 6.4.2 If the value of  $R_2$  is decreased, the brightness of the lamp will increase. Explain how this occurs. (6)
- 6.4.3 Explain the function of  $R_1$ . (2)
- 6.5 Name ONE advantage of THYRISTOR control when compared to RESISTOR control. (1)
- [25]**

**QUESTION 7: AMPLIFIERS**

7.1 Redraw and complete the table in FIGURE 7.1 in your ANSWER BOOK.



INPUT	OUTPUT
If $V_1 > V_2$	$V_{OUT} =$
If $V_1 < V_2$	$V_{OUT} =$
If $V_1 = V_2$	$V_{OUT} =$

**FIGURE 7.1: OP-AMP**

(3)

7.2 Draw a non-inverting voltage comparator using an op-amp.

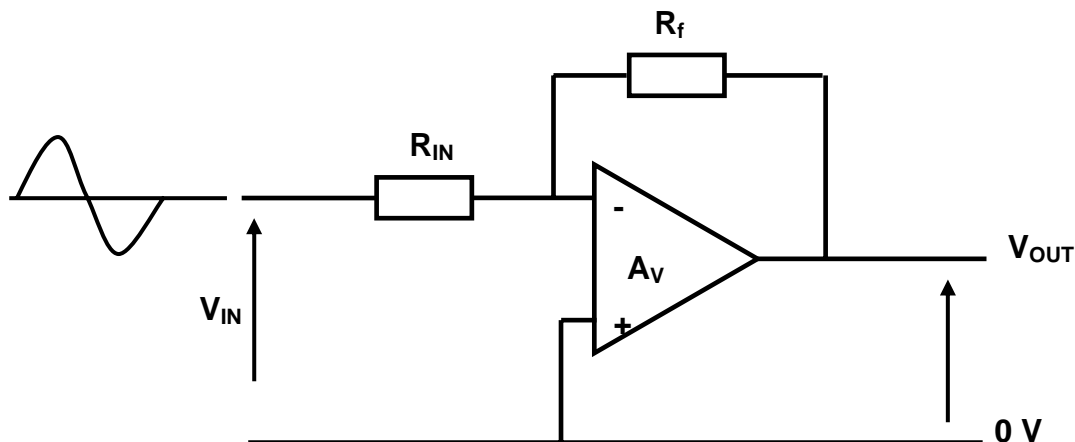
(5)

7.3 Describe the working principle of an op-amp.

(3)



7.4 Answer the following questions with reference to FIGURE 7.2.



**FIGURE 7.2: OP-AMP CIRCUIT**

- 7.4.1 Name the circuit above. (1)
- 7.4.2 With the given input signal, draw the output signal and the input signal on the same axis. (2)
- 7.4.3 Describe what will occur to the feedback if the value of  $R_f$  is increased. (3)
- 7.4.4 Explain the function of  $R_{in}$ . (2)
- 7.4.5 What is common to both the input and output? (1)
- 7.5 State whether an op-amp is a voltage or a current amplifier. (1)
- 7.6 Describe the following terms with reference to the characteristics of an ideal op-amp:
- 7.6.1 Unconditional stability (2)
- 7.6.2 Differential inputs, in other words two inputs (2)
- [25]**

### QUESTION 8: THREE-PHASE TRANSFORMERS

- 8.1 Name ONE type of loss in a transformer. (1)
- 8.2 When transmitting power over a long distance, the secondary side of the step-up transformer is connected to the high-tension conductors. Is the secondary connected in star or delta? Explain your answer. (3)
- 8.3 Explain why the core of a transformer is made of laminated plates and not of a solid iron core. (2)

- 8.4 A star-star-connected transformer has 800 turns per phase on its primary windings and 60 turns per phase on its secondary windings. The transformer is connected to an 8 kV supply.

Given:

$$N_P = 800$$

$$N_S = 60$$

$$V_{L(P)} = 8 \text{ kV}$$

Calculate the following:

8.4.1 The primary phase voltage (3)

8.4.2 The secondary phase voltage (3)

- 8.5 A step-up transformer can step up voltage from a low value to a very high value. Can it step up power? Explain your answer. (3)  
**[15]**

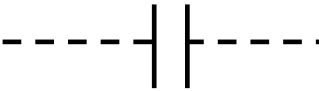
#### QUESTION 9: LOGIC CONCEPTS AND PLCs


- 9.1 Give TWO examples of the following with reference to PLCs:

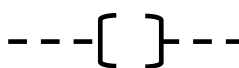
9.1.1 Inputs (2)

9.1.2 Outputs (2)

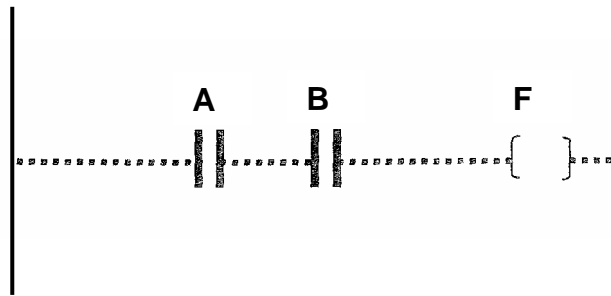
- 9.2 Name the following ladder diagram symbols:

9.2.1  (1)

9.2.2  (1)

9.2.3  (1)

9.3 Answer the questions below with reference to FIGURE 9.1.



**FIGURE 9.1: LADDER DIAGRAM**

9.3.1 Name the logic gate that FIGURE 9.1 represents. (1)

9.3.2 Draw the logic symbol of the gate. (2)

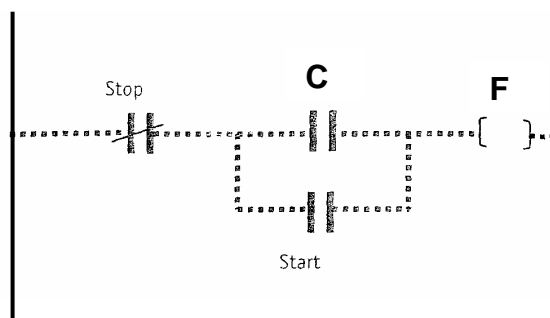
9.3.3 Draw a circuit diagram using two switches and a lamp that represents the gate. (4)

9.4 The following operands are used in the programming of PLCs. Give TWO examples of each and give the symbol of each operand:

9.4.1 Timing devices (3)

9.4.2 Counting devices (3)

9.5 Draw the relay control circuit of the ladder logic diagram in FIGURE 9.2 in your ANSWER BOOK.



**FIGURE 9.2: LADDER LOGIC DIAGRAM OF A STARTER** (6)

9.6 With reference to relay control:

9.6.1 Explain why a PLC is more economical. (2)

9.6.2 Explain why a PLC has quicker delivery. (2)

9.6.3 Explain why a PLC requires less maintenance. (2)

9.7 Describe what PLCs are used for and give ONE example. (3)

**[35]**



**QUESTION 10: THREE-PHASE MOTORS AND CONTROL**

- 10.1 Name ONE method of cooling three-phase induction motors. (1)
- 10.2 A three-phase delta-connected induction motor draws a current of 20 A from a 380 V/50 Hz supply. The motor is 100% efficient and has a power factor of 0,8 at full load.
- Given:
- $I_L = 20 \text{ A}$   
 $V_L = 380 \text{ V}$   
 $f = 50 \text{ Hz}$   
 $\eta = 100\%$   
 $\cos\theta = 0,8$
- Calculate:
- 10.2.1 The output power of the motor (3)
- 10.2.2 The apparent power of the motor (3)
- 10.2.3 The phase current of the motor (3)
- 10.3 Give THREE possible electrical reasons why a three-phase induction motor will not run when it is started. (3)
- 10.4 Describe ONE electrical inspection that must be done before installing a three-phase motor. (2)
- 10.5 Name THREE losses that occur in three-phase induction motors. (3)
- 10.6 Describe the basic principle of operation of a three-phase induction motor. (7)
- 10.7 Describe the function of a no-volt coil in a three-phase motor starter. (2)
- 10.8 Describe why interlocking contacts are necessary in a three-phase star-delta motor starter. (2)
- 10.9 State how the rotation of a three-phase motor can be reversed. (1)
- [30]**

**TOTAL: 200**

**FORMULA SHEET**

$$X_L = 2\pi fL$$

$$X_C = \frac{1}{2\pi fC}$$

$$Z = \sqrt{R^2 + (X_L \cong X_C)^2}$$

$$I_T = \sqrt{I_R^2 + (I_C \cong I_L)^2}$$

$$V_T = \sqrt{V_R^2 + (V_C \cong V_L)^2}$$

$$V_R = IR$$

$$V_L = IX_L$$

$$V_C = IX_C$$

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

$$Q = \frac{1}{R}\sqrt{\frac{L}{C}}$$

$$Q = \frac{X_L}{R} = \frac{V_L}{V_R}$$

$$\cos\theta = \frac{I_R}{I_T}$$

$$\cos\theta = \frac{R}{Z}$$

$$\left. \begin{array}{l} P = VI \cos\theta \\ S = VI \\ Q = VI \sin\theta \end{array} \right\} \text{Single phase}$$

$$\left. \begin{array}{l} P = \sqrt{3} V_L I_L \cos\theta \\ S = \sqrt{3} V_L I_L \\ Q = \sqrt{3} V_L I_L \sin\theta \end{array} \right\} \text{Three phase}$$

$$\left. \begin{array}{l} V_L = V_{ph} \\ I_L = \sqrt{3} I_{ph} \end{array} \right\} \text{Delta}$$

$$\left. \begin{array}{l} V_L = \sqrt{3} V_{ph} \\ I_L = I_{ph} \end{array} \right\} \text{Star}$$

$$f = \frac{1}{T}$$

$$\frac{V_{ph(P)}}{V_{ph(S)}} = \frac{N_P}{N_S} = \frac{I_{ph(S)}}{I_{ph(P)}}$$







# FORMULEBLAD

$$X_L = 2\pi fL$$

$$X_C = \frac{1}{2\pi fC}$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$I_T = \sqrt{I_R^2 + (I_C - I_L)^2}$$

$$V_T = \sqrt{V_R^2 + (V_C - V_L)^2}$$

$$V_R = IR$$

$$V_L = IX_L$$

$$V_C = IX_C$$

$$f_r = \frac{1}{2\pi\sqrt{LC}}$$

$$\tilde{Q} = \frac{1}{L}\sqrt{\frac{C}{L}}$$

$$\tilde{Q} = \frac{X_L}{X_C} = \frac{R}{V_L} \frac{V_R}{I_r}$$

$$\cos\theta = \frac{I_r}{I_R}$$

$$\cos\theta = \frac{Z}{R}$$

$$P = VI\cos\theta$$

$$S = VI$$

Enkeelfase

$$f = \frac{1}{T}$$

$$\frac{V_{f(S)}}{V_{f(P)}} = \frac{N_P}{N_S} = \frac{I_{f(P)}}{I_{f(S)}}$$

$$\left\{ \begin{array}{l} V_L = \sqrt{3} V_f \\ I_L = I_f \end{array} \right. \text{Ster}$$

$$\left\{ \begin{array}{l} V_L = V_f \\ I_L = \sqrt{3} I_f \end{array} \right. \text{Delta}$$

$$\left\{ \begin{array}{l} P = \sqrt{3} V_L I_L \cos\theta \\ S = \sqrt{3} V_L I_L \\ \tilde{Q} = \sqrt{3} V_L I_L \sin\theta \end{array} \right. \text{Driefase}$$



EASTERN CAPE



# VRAAG 10: DRIEFASEMOTORS EN BEHEER

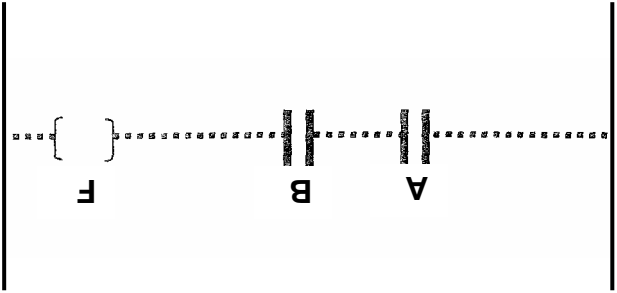
10.1	Noem EEN metode om driefase-induksiemotors te verkoel.	(1)
10.2	'n Driefase- delta-verbinde induksiemotor trek 'n stroom van 20 A van 'n 380 V/50 Hz-toevoer. Die motor is 100% doeltreffend met 'n arbeidsfaktor van 0,8 teen vollas.	
Gegee:		
$I_L = 20 \text{ A}$ $V_L = 380 \text{ V}$ $f = 50 \text{ Hz}$ $\eta = 100\%$ $\cos\theta = 0,8$		
Bereken:		
10.2.1	Die uitsetkrag van die motor	(3)
10.2.2	Die skyndrywing van die motor	(3)
10.2.3	Die fasesstroom van die motor	(3)
10.3	Noem DRIE moontlike elektreiese redes waarom 'n driefase-induksiemotor nie sal loop wanneer dit aangeskakel word nie.	(3)
10.4	Beskryf EEN elektreiese inspeksie wat voor die installasie van 'n driefasemotor uitgevoer moet word.	(2)
10.5	Noem DRIE verliese wat in driefase-induksiemotors voorkom.	(3)
10.6	Beskryf die basiese werkbeginsel van 'n driefase-induksiemotor.	(7)
10.7	Beskryf die funksie van 'n nulspanningspoel in 'n driefase-motoraansitter.	(2)
10.8	Beskryf hoekom grendelkontakte in 'n driefase-ster/delta-motoraansitter nodig is.	(2)
10.9	Noem hoe die rotasie van 'n driefasemotor omgekeer kan word.	(1)

TOTAAL: 200

[30]



9.3 Beantwoord die vrae hieronder met verwysing na FIGUR 9.1.



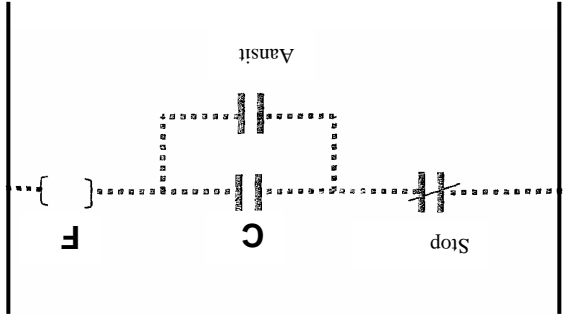
FIGUR 9.1: LEERDIAGRAM

- 9.3.1 Benoem die logikahek wat deur FIGUR 9.1 voorgestel word. (1)
- 9.3.2 Teken die logikasimbool van die hek. (2)
- 9.3.3 Teken 'n kringdiagram deur twee skakelaars en 'n lamp wat die hek voorstel, te gebruik. (4)

9.4 Die volgende operande word in die programmering van PLB's gebruik. Gee TWEE voorbeelde van elk, asook die simbool van elke operand:

- 9.4.1 Tydreëltoestelle (3)
- 9.4.2 Tellers (3)

9.5 Teken die relê-beheerkring van die leerlogikadiagram in FIGUR 9.2 in jou ANTWOORDEBOEK.



FIGUR 9.2: LEERLOGIKADIAGRAM VAN 'N AANSITTER

9.6 Met verwysing na relêbeheer:

- 9.6.1 Verduidelik hoekom 'n PLB ekonomieser is (2)
- 9.6.2 Verduidelik hoekom 'n PLB vinniger aflewering het (2)
- 9.6.3 Verduidelik hoekom 'n PLB minder instandhouding vereis (2)
- 9.7 Beskryf waarvoor PLB's gebruik word en gee EEN voorbeeld. (3)

[35]



8.4 'n Ster-ster-verbinde transformator het 800 windings per fase aan sy primêre kant en 60 windings per fase aan sy sekondêre kant. Die transformator word aan 'n 8 kV-toevoer verbind.

Geggee:

$$N_p = 800$$

$$N_s = 60$$

$$V_{L(P)} = 8 \text{ kV}$$

Bereken die volgende:

8.4.1 Die primêre fasespanning

8.4.2 Die sekondêre fasespanning

8.5 'n Verhogingstransformator kan 'n spanning met 'n lae waarde na 'n spanning met 'n baie hoë waarde verhoog. Kan dit krag verhoog? Verduidelik jou antwoord.

### VRAAG 9: LOGIKAKONSEPTE EN PLB'S

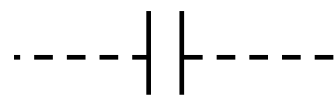
9.1 Gee TWEE voorbeelde van die volgende met verwysing na PLB's:

9.1.1 Insette

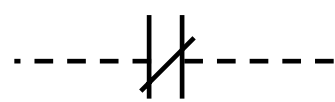
9.1.2 Uitsette

9.2 Benoem die volgende leerdigramsimbole:

9.2.1



9.2.2



9.2.3



(1)

(1)

(1)

(2)

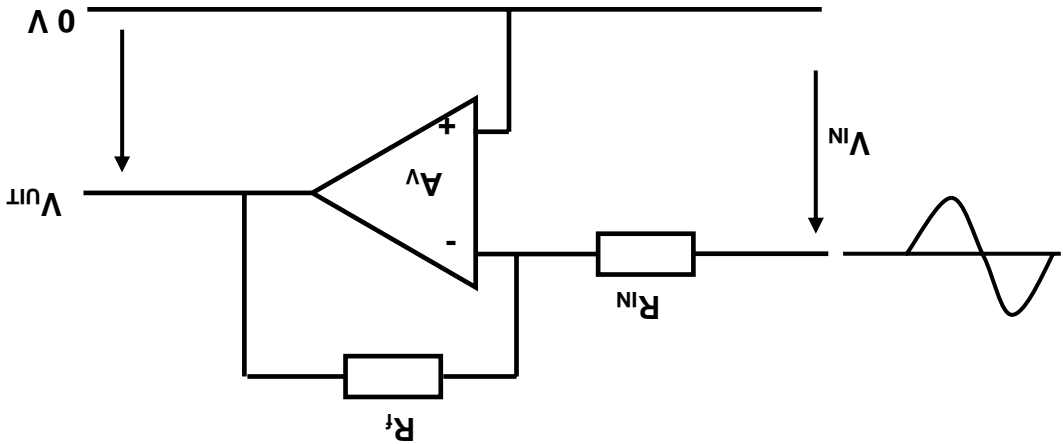
(2)

[15]



7.4

Beantwoord die volgende vrae met verwysing na FIGUR 7.2.



FIGUR 7.2: 'OP AMP'-KRING

7.4.1 Benoem die kring hierbo.

7.4.2 Met die gegee insetsein, teken die uitsetsein en die insetsein op dieselfde as.

7.4.3 Beskryf wat met die terugvoering sal gebeur indien die waarde van  $R_f$  verhoog word.

7.4.4 Verduidelik die funksie van  $R_{in}$ .

7.4.5 Wat het die inset en uitset in gemeen?

7.5 Sê of 'n 'op amp' 'n spanningsversterker of 'n stroomversterker is.

7.6 Beskryf die volgende terme met verwysing na die kenmerke van 'n ideale 'op amp':

7.6.1 Onvoorwaardelike stabiliteit

7.6.2 Differensiaalinsette, met ander woorde twee insette

[25]

VRAAG 8: DRIEFASETTRANSFORMATORS

8.1 Noem EEN tipe verlies in 'n transformator.

8.2 Wanneer krag oor 'n lang afstand gestuur word, word die sekondêre kant van die verhogingstransformator aan die hoogspanningsgeleiers verbind. Is die sekondêre kant in ster of delta verbind? Verduidelik jou antwoord.

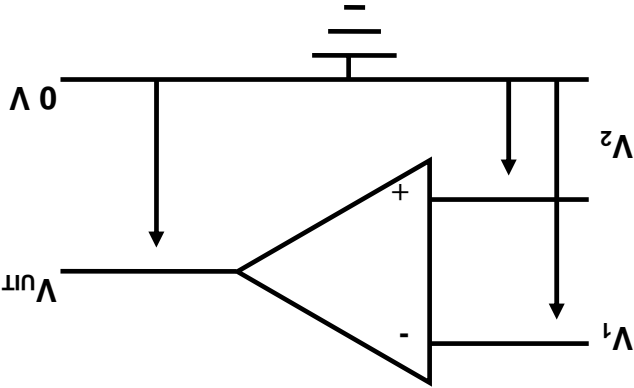
8.3 Verduidelik hoekom die kern van 'n transformator van lamelplate gemaak word en nie met 'n soliede ysterkern nie.





VRAAG 7: VERSTERKERS

7.1 Teken die tabel in FIGUR 7.1 in jou ANTWOORDEBOEK oor en voltooi dit.



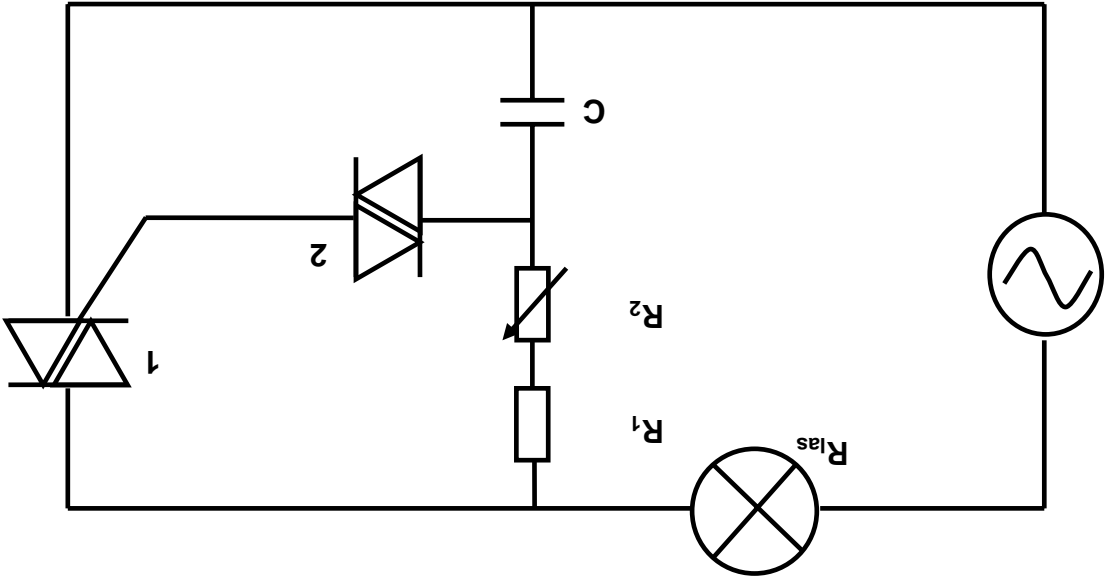
INSET	UITSET
As $V_1 < V_2$	$V_{uit} =$
As $V_1 > V_2$	$V_{uit} =$
As $V_1 = V_2$	$V_{uit} =$

FIGUR 7.1: OPERASIONELE VERSTERKER (OP AMP)

- 7.2 Teken 'n nie-omkeerspanningsvergelyker deur 'n operasionele versterker ('op amp') te gebruik. (5)
- 7.3 Beskryf die werkbeginsel van 'n 'op amp'. (3)

6.4

Die ligdempkring in FIGUR 6.2 word aan 'n 220 V/50 Hz-toevoer verbind.



FIGUR 6.2: LIGDEMPKRING

6.4.1 Benoem die komponente gemerk 1 en 2. (2)

6.4.2 As die waarde van  $R_2$  verminder word, neem die helderheid van die lamp toe. Verduidelik hoe dit gebeur. (6)

6.4.3 Verduidelik die funksie van  $R_1$ . (2)

6.5 Noem EEN voordeel van TIRISTOR-beheer wanneer dit met RESISTOR-beheer vergelyk word. (1)

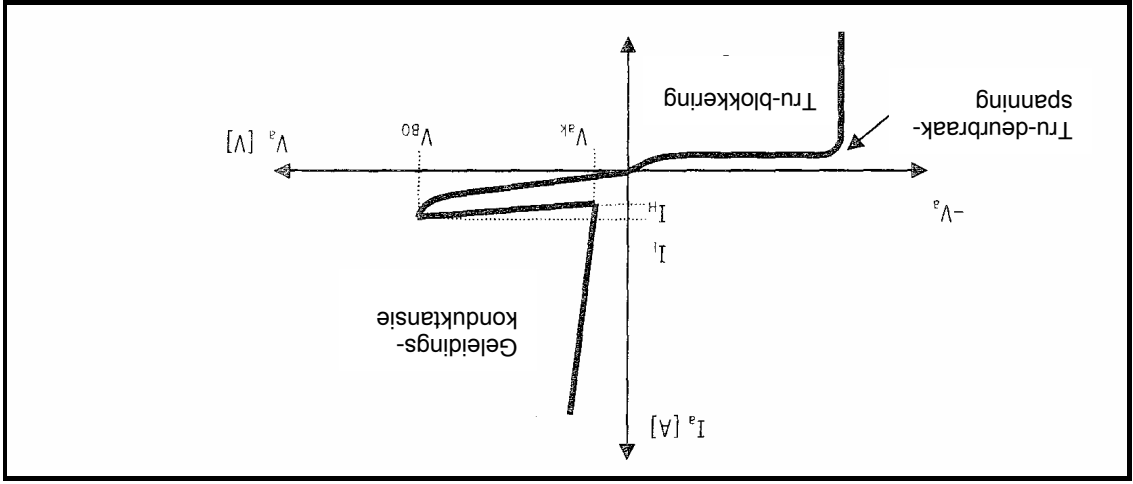
[25]



VRAAG 6: SKAKEL- EN BEHEERKRINGE

- 6.1      Teken 'n volledig benoemde simbool van 'n SBG.      (3)
- 6.2      Beskryf EEN metode om 'n SBG aan te skakel.      (3)
- 6.3      Die diagram in FIGUR 6.1 is die kenkromme van 'n SBG. Beantwoord die volgende vrae deur na FIGUR 6.1 te verwys.      (3)

6.3      Die diagram in FIGUR 6.1 is die kenkromme van 'n SBG. Beantwoord die volgende vrae deur na FIGUR 6.1 te verwys.



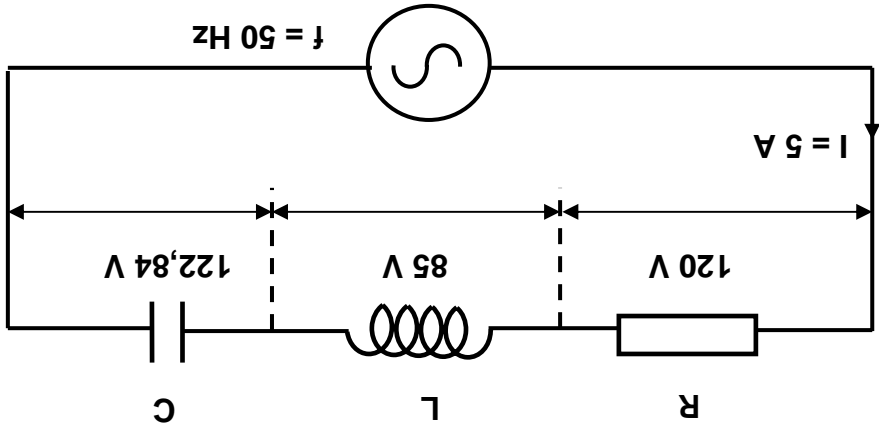
FIGUR 6.1: KENKROMME VAN 'N SBG

- 6.3.1      Verduidelik wat by tru-deurbrakspanning gebeur.      (3)
- 6.3.2      Wanneer die SBG gelei (verwys na FIGUR 6.1), wat sal die spanningsval oor die SBG wees?      (1)
- 6.3.3      Wanneer die SBG gelei, beskryf wat die stroomvloei deur die SBG depaal?      (2)
- 6.3.4      Wat sal gebeur as die stroomvloei deur die SBG tot onder  $I_H$  val?      (2)



5.4

Verwys na die kring in FIGUR 5.1.



FIGUR 5.1: RLC-SERIEKRING

Gegee:

$$\begin{aligned} V_R &= 120 \text{ V} \\ V_L &= 85 \text{ V} \\ V_C &= 122,84 \text{ V} \\ I_S &= 5 \text{ A} \\ f &= 50 \text{ Hz} \end{aligned}$$

Bereken die volgende:

5.4.1 Die toevoerspanning

5.4.2 Die induktiewe reaktansie van die induktor

5.4.3 Die kapasitiewe reaktansie van die kapasitor

5.4.4 Die kapasitansie van die kapasitor

5.4.5 Teken die fasordiagram van die kring. Dui die rigting van rotasie aan.

[30]





## VRAAG 4: DRIEFASE-WS-OPWEKING

- 4.1 Noem TWEE voordele van 'n driefaseselsel in vergelyking met 'n enkelfaseselsel. (2)

- 4.2 Kragverspreiding na alle verbruikers word in die sterverbinding gedoen. Verduidelik hoekom. (2)

- 4.3 'n Driefase- gebalanseerde las word oor 'n 380 V-toevoer in delta verbind. Die lasstroom is 5 A met 'n arbeidsfaktor van 0,9. (3)

Geggee:

$$V_L = 380 \text{ V}$$

$$I_L = 5 \text{ A}$$

$$\cos \theta = 0,9$$

Bereken die volgende:

- 4.3.1 Die stroom in elke fase van die las (3)

- 4.3.2 Die totale krag deur die las verbruik (3)

[10]

## VRAAG 5: RLC-KRINGE

- 5.1 Wat sal gebeur met die helderheid van 'n gloeilamp wat in serie met 'n RC-kring verbind is, indien die frekwensie van die toevoer verlaag word? (1)

- 5.2 Noem EEN nadeel van 'n swak arbeidsfaktor. (1)

- 5.3 'n Kapasitor met 'n kapasitiewe reaktansie van  $250 \Omega$ , 'n induktor met 'n induktiewe reaktansie van  $300 \Omega$  en 'n resistor met 'n weerstand van  $500 \Omega$  word almal in serie aan 'n 220 V/50 Hz-toevoer verbind. (3)

Geggee:

$$X_C = 250 \Omega$$

$$X_L = 300 \Omega$$

$$R = 500 \Omega$$

$$V_S = 220 \text{ V}$$

$$f = 50 \text{ Hz}$$

- 5.3.1 Teken 'n benoemde diagram van die kring. (4)

- 5.3.2 Bereken die totale impedansie van die kring. (3)

- 5.3.3 Bereken die arbeidsfaktor van die kring en sê of dit voorlopend of nalopend is. (4)



EASTERN CAPE



## VRAAG 1: TEKNOLOGIE, GEMEENSKAP EN DIE OMGEWING

- 1.1 Beskryf hoekom dit oneties en onwettig is om van 'n persoon sonder die vereiste opleiding te verwag om aan elektriese toerusting te werk. (3)
- 1.2 Wanneer 'n entrepreneur 'n nuwe produk wil bekendstel, moet hy eers marknavorsing doen. Gee TWEE redes hoekom, en beskryf waarom dit belangrik is. (4)
- 1.3 Aardverwarming het 'n groot negatiewe impak op ons gemeenskap en omgewing. Noem DRIE geskikte energiebronne wat min negatiewe impak op die omgewing het. (3)
- 2.1 Met verwysing na die ontwerpprobleem in jou PAT-projek, noem DRIE van die tegnologiese stappe wat gevolg moet word. (3)
- 2.2 Gee DRIE redes waarom dit belangrik is om die tegnologiese proses met die voltooiing van 'n artefak/projek te volg. (3)
- 2.3 Die ontwerp van die kringbord wat in jou PAT gebruik word, is belangrik. Beskryf, deur TWEE redes te gee, hoekom dit belangrik is. (4)
- 3.1 Noem hoekom dit gevaarlik is om water te gebruik om 'n elektriese vuur mee te blus. (2)
- 3.2 Verduidelik hoekom dit belangrik is om die korrekte vlak van beligting in 'n elektriesetegnologie-werkswinkel te hê. (2)
- 3.3 Noem TWEE maniere waarop MIV/Vigs tussen mense oorgedra kan word. (2)
- 3.4 Beskryf hoe 'n aardlek-eenheid 'n persoon teen elektriese skok kan beskerm wanneer 'n foutiewe elektriese toestel gebruik word. (2)
- 3.5 Noem EEN noodsaaklike stuk veiligheids-toerusting wat gebruik moet word wanneer met 'n slypmasjien gewerk word. (1)
- 3.6 Gee EEN rede hoekom dit belangrik is om gereedskap in 'n goeie toestand te hou. (1)

## VRAAG 3: BEROEPSGESONDHEID EN -VEILIGHEID

## INSTRUKSIES EN INLIGTING

1. Beantwoord AL die vrae.
2. Sketse en diagramme moet groot en netjies wees en volledig benoem word.
3. Toon ALLE berekeninge, korrek tot TWEE desimale plekke afgerond.
4. Nummer die antwoorde korrek volgens die nommeringstelsel wat in hierdie vraestel gebruik is.
5. Nie-programmeerbare sakrekenaars mag gebruik word.
6. Toon die eenheid van al die antwoorde van berekeninge.
7. 'n Formuleblad word aan die einde van hierdie vraestel voorsien.
8. Skryf netjies en leesbaar.





Hierdie vraestel bestaan uit 12 bladsye en 1 formuleblad.



TYD: 3 uur

PUNTE: 200

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