MEMORANDUM

QUESTION 1

1.1 To establish a system of control so that no unauthorised person can energise or activate a machine on which people are working. (4)

1.2
- When holding work while grinding
- When working with hot objects
- When working with sharp objects
- These are not insulated gloves for working on live conductors. (2 bonus points!)

1.3 Fires involving flammable liquids e.g. petrol, paraffin, benzene, oils or fat.
   Dry powder and foam types of fire extinguishers
   Gas types, such as carbon dioxide or halon gases can be used on smaller Class "B" fires. (5)

QUESTION 2

2.1 A device, which has the ability to maintain a potential difference between two points while a continuous current is flowing between those two points, is said to develop an electromotive force (EMF). (4)

2.2 Volt

2.3

\[ R_1 = 2 \, \Omega \quad R_2 = 3 \, \Omega \quad R_3 = 5 \, \Omega \]

\[ I_1 \quad I_2 \quad I_3 \]

\[ V_1 \quad V_2 \quad V_3 \]

\[ I_T \]

\[ V_T = 20 \, V \]

(\[ \sqrt{1} \quad \sqrt{1} \] )

2.3.1 \[ R_T = R_1 + R_2 + R_3 \]

\[ = 2 + 3 + 5 \]

\[ = 10 \, \Omega \]
2.3.2 \[ I_T = I_1 = I_2 = I_3 \] (bonus) \\
\[ I_T = V_T + R_T \] \\
\[ = 20 + 10 \] \\
\[ = 20 \] (2) \\
\[ = 2 A \] \\
\[ \sqrt{ } \] \\

2.3.3 \[ V_1 = I_T \times R_1 \] (\checkmark) \\
\[ V_2 = I_T \times R_2 \] (\checkmark) \\
\[ V_3 = I_T \times R_3 \] (\checkmark) \\
\[ = 2 \times 2 \] \\
\[ = 2 \times 3 \] \\
\[ = 2 \times 5 \] \\
\[ = 4 V \] (\checkmark) \\
\[ = 6 V \] (\checkmark) \\
\[ = 10 V \] (\checkmark) \\
(6) \\

2.3.4 \[ P_T = V_T \times I_T \] (\checkmark) OR \[ I_T^2 \times R_T \] (\checkmark) OR \[ V_T^2 + R_T \] (\checkmark) \\
\[ = 20 \times 2 \] \\
\[ = 40 W \] (\checkmark) \\
(2) \\

2.4.1 \[ r = (E + I) - R \] (\checkmark) \\
\[ = (1.52 + 0.4) - 2 \] \\
\[ = 1.8 \Omega \] (\checkmark) \\
(2) \\

2.4.2 \[ V = E - Ir \] (\checkmark) OR \[ V = IR \] (\checkmark) \\
\[ = 1.52 - (0.4 \times 1.8) \] \\
\[ = 0.8 V \] (\checkmark) \\
(2) [25] \\

**QUESTION 3**

3.1 
\[ \checkmark \text{Hold the first three fingers of your left hand} \] 
\[ \checkmark \text{mutually at right angles to each other} \] 
\[ \checkmark \text{Point the index finger (first finger) in the direction of the main magnetic flux, and} \] 
\[ \checkmark \text{the middle finger in the direction of the current.} \] 
\[ \checkmark \text{The thumb then indicates the direction of the force exerted on the conductor.} \] (5)
3.2

**AUTO-TRANSFORMER**

**QUESTION 4**

4.1 Electric cells are devices in which chemical energy is converted into electrical energy. *(2 bonus points)*
- In primary cells the chemical reaction is irreversible
- The electrical energy current delivered by the cell consumes materials that cannot be replenished by recharging
- In secondary cells the chemical action is reversible
- The cell can be recharged repeatedly
- By passing a current through it in the opposite direction to the current flow during discharge.

4.2

Discharging Action of a Lead-Acid Cell

*(Sketch only: 2 pts)*

- Decreasing Lead Dioxide & Increasing Lead Sulphate
- Decreasing Acid & Increasing Water
- Electrolyte and Separators

*(5)*

*(10)*
QUESTION 5

5.1. An EMF is induced in an electric circuit whenever there is a change in the magnetic flux linking with the circuit.

5.2.1 When an ac wave (current, voltage or flux) completes 360 electrical degrees.

5.2.2 Time taken for a wave to complete one cycle.

5.2.3 Number of cycles that an ac wave completes in one second. (measured in Hertz)

5.2.4 Value of an ac waveform at a specific instant.

5.2.5 0.637 of the maximum value of the wave.

5.2.6 Effective value of the wave OR 0.707 of the maximum value.

QUESTION 6

![Diagram of a PVC wire armoured cable]

QUESTION 7

7.1.1

7.1.2

7.1.3

7.1.4
7.2
- Earth continuity conductor
- Earth lead
- Earth electrode

QUESTION 8

8.1

The Characteristics of a Junction Diode on Forward-Bias

8.2

\[
\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} = \frac{1}{4} + \frac{1}{6} = 0.4167 \\
C_T = \frac{1}{0.4167} = 2.4 \mu F
\]

TOTAL: [100]
ELEKTROVAktorIE N1: NOVEMBER 2003

MEMORANDUM

VRAAG 1

1.1 Om 'n stelsel van beheer/kontrole daar te stel sodat geen ongemagtigde persone 'n masjien waaraan mense werk, kan aktiveer of bekrak nie.

1.2: Wanneer werk vasgehou moet word terwyl daar geskuur word
Wanneer met warm voorwerpe gewerk word
Hierdie is nie isoleerhandskoene wat vir lewendige geleiers gebruik word nie

(3) (2 bonuspunte)

1.3. Vure waar daar onder andere vlambare stowwe, byvoorbeeld petrol, parafien, bensien of vet betrokke is.
Droër poeier- en skuimtipes brandblussers
Gassoortie soos byvoorbeeld koolstofdioksied of halogeen(?) 'halon' kan op kleiner Klas 'B' vure gebruik word.

VRAAG 2

2.1 'n Toestel wat oor die vermoë beskik om potensieele verskil tussen twee punte te handhaaf terwyl 'n gelykstroom tussen daardie twee punte vloei, ontwikkel 'n elektromotoriese krag (EMK).

2.2 Volt

2.3

\[ R_1 = 2 \ \Omega \quad R_2 = 3 \ \Omega \quad R_3 = 5 \ \Omega \]

\[ V_1 \quad V_2 \quad V_3 \]

\[ I_T \]

\[ V_T = 20 \ \text{V} \]

\[ I = \frac{1}{2} \quad \sqrt{1} \]

2.3.1 \[ R_T = R_1 + R_2 + R_3 \]

= 2 + 3 + 5

= 10 \ \Omega