higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

FAULT FINDING AND PROTECTIVE DEVICES N6

1 AUGUST 2019

This marking guideline consists of 6 pages.

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QUESTION 1

1.1 It means a battery is continually connected to a load and is designed to maintain a constant voltage throughout its load range. The voltage of the battery should supply sufficient current to the battery to overcome internal losses and keep the battery fully charged so that the voltage from the battery remains at the correct value. (2)

1.2
- No smoking during maintenance.
- Acid will destroy an alkaline cell.
- Avoid spilling and keep installation dry.
- If a body is enclosed in steel, normally positive, insulate them from each other.
- Check battery lugs for dry or poor connections.
- Do not treat battery terminals of interconnections with grease.
- Clean off deposits on top surface of cell.
- Investigate cells for cracks.
- If electrolyte is in excess of normal use, check charging rate.
- Test voltage of each cell.
- Record S.G readings.
- A yearly boost charger is recommended.
- Never leave boost chargre on, if unattended.
- Check if voltage is retained after switching off for a period.
- Check output voltage. (16)

[18]

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QUESTION 2

2.1

$$I_B = \frac{V/\sqrt{3}}{Zs + ZL1}$$

$$= \frac{11\,000/\sqrt{3}}{0{,}403 + 0{,}28}$$

$$= 9\,298{,}467\ A$$

$$I = \frac{Vine/\sqrt{3}}{zZtotal} = Zs + Z12 + Z\ trans$$

$$Zs = \frac{(Vl)^2}{MVA} = \frac{(11\,000)^2}{300 \times 106} = 0{,}4\,033\ \Omega$$

$$Zl_1 = 0{,}28\ \Omega \quad ZI_2 = 0{,}38\ \Omega$$

$$Ztrans = \frac{(Vl)^2}{MVA} \times \%Z$$

$$= \frac{(11\,000)^2}{4 \times 10^6} \times \frac{7}{100}$$

$$= 2{,}12\ \Omega$$

$$At\ point\ F1ZT = 04033 + 0{,}28 + 0{,}038 + 2{,}12$$

$$= 2{,}8413\ \Omega$$

$$If_1 = \frac{Vl\sqrt{3}}{Ztot} = \frac{1\,000}{3 \times 2{,}8413} = 2235{,}193\ A$$

(6)

2.2 Protection relay is a relay designed to initiate disconnection of a part of an electrical installation or to operate a warning signal in the case of a fault or other abnormal condition in the installation.✓ It may include more than one unit electrical relay and accessory.✓ (2)

2.3
- Current transformer
- Voltage transformer
- Relay
- Circuit breaker
- Battery
- Tripping coil (Any 5 × 1) (5)

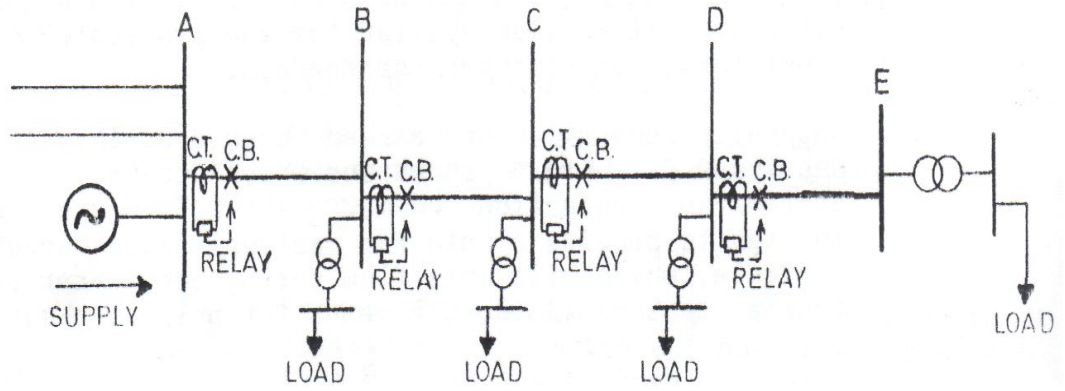
[13]

QUESTION 3

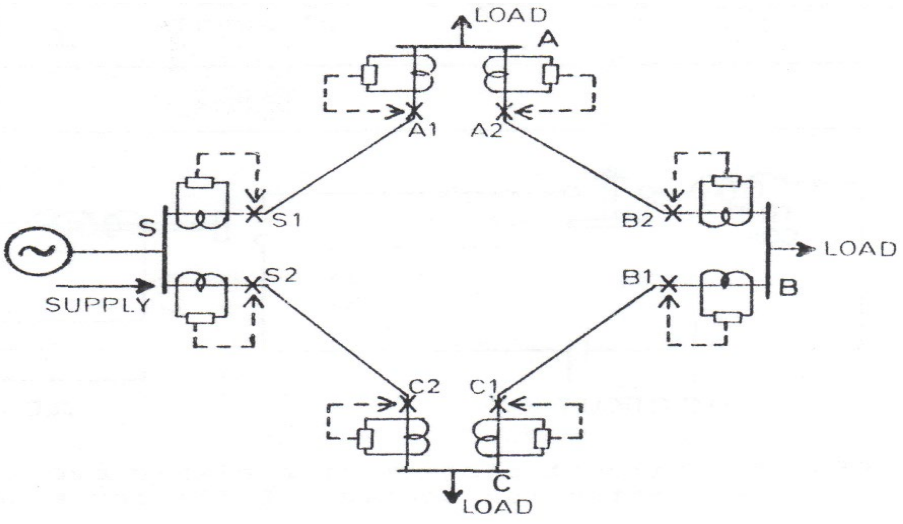
3.1 A positive charge cloud will induce a negative charge into both conductors and earth wire so that the potential gradient in the neighborhood of the line is reduced. The magnitude of the line is thus less and the line is protected. (3)

3.2
- Spark-over voltage
- Operating duty cycle
- Surface contamination
- Unipolar oscillating impulse
- Duty test with repeated spark-over
- Partial discharge test
- Exposure to changing temperature
- Vibration seismic test (Any 8 × 1) (8)

3.3 Radial feeders: the main characteristic of the radial system is that power can flow in only one direction from generation to load.



Ring feeders: in a loop system power can flow in both directions providing a more reliable supply.
This system is characterised by the use of only one source of supply.



(8)
[19]

QUESTION 4

4.1 4.1.1 Rate of gas evolution that will instantaneously cause the alarm to operate.

4.1.2 Evolution rate that will cause displacement of oil to operate a relay which activates the alarm

4.1.3 Gradual collection of gas, requiring days or weeks to accumulate

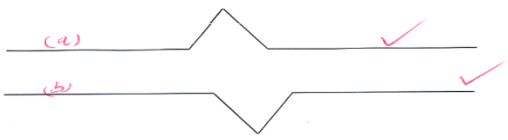
(3 × 2) (6)

4.2
- Water content
- Acidity
- Density
- Flash point
- Pour point
- Oxidation
- Sludge
- Viscosity
- Corrosive sulphur
- Electric strength
- Neutralisation
- Dissipation value (12)

[18]

QUESTION 5

5.1



(2)

5.2
- Conductors can be made larger than required to carry the current.
- The radius of the conductor may be increased at the centre of the cross
- Special shaping of the outer conductor to present a smoother surface
- Internal radius of lead sheath and thus thickness of the insulation may be increased leading to bulky and costly cable (4)

5.3 It works on the principle of a pulse that is injected into the cable.✓ It takes a certain time for the pulse to travel through the healthy core of the cable, and back to the instrument.✓ The pulse shape and time interval can be observed on the oscilloscope.✓ The time interval of the pulse that travels through the faulty core will be less than that of the healthy core.✓ With a simple calculation the time interval can be converted to distance to determine the distance of the fault.✓ (5)

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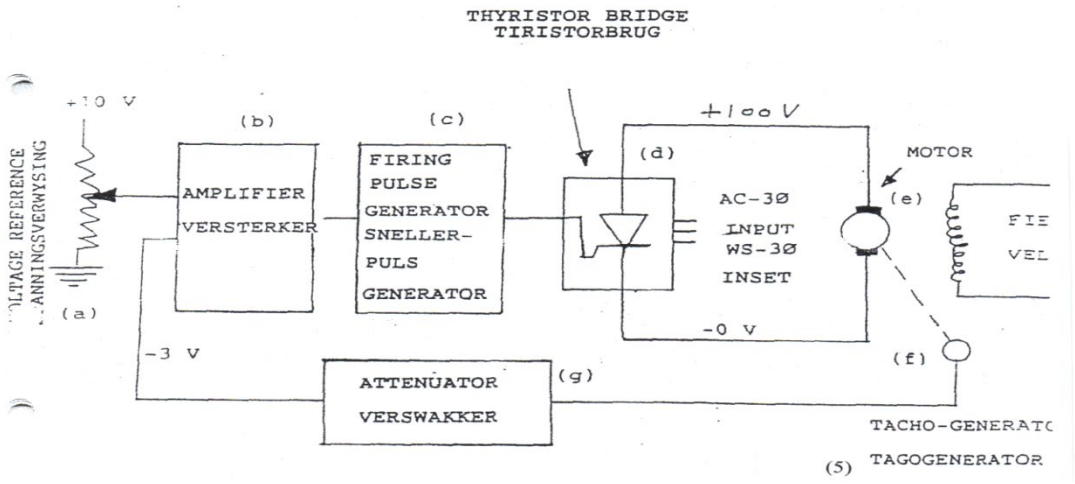
5.4
- Using buthane flame tester
- Doing pressure test
- Doing vacuum test
- Using buscholtz (4)

[15]

QUESTION 6

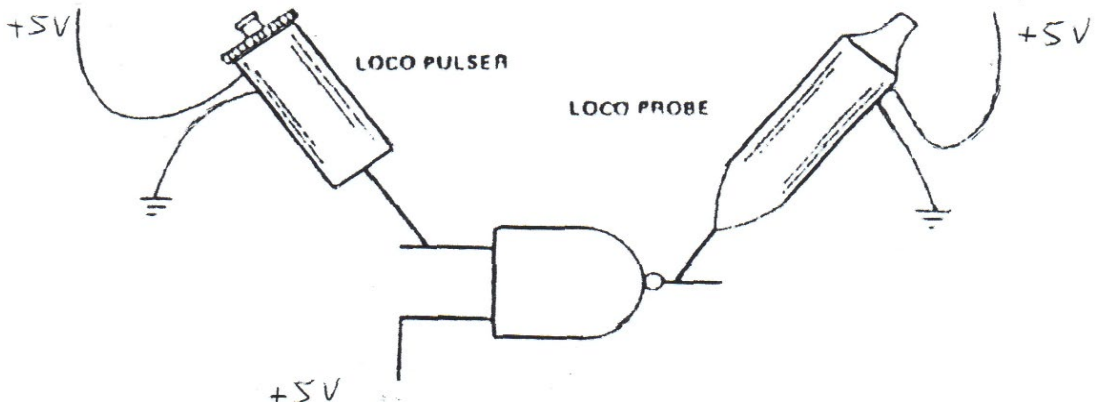
6.1
- Forward voltage
- Peak forward and reverse blocking voltage
- Conducting angle
- Rate of rise DI/DT
- Rate of rise voltage dv/dt
- Turn on and turn off times
- Blocking voltages
- Leaking current
- Latching current
- Holding current
- Average forward voltages (Any 8 × 1) (8)

6.2



(5)

6.3



(4)

[17]

TOTAL: 100

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