higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

FAULT FINDING AND PROTECTIVE DEVICES N6

30 July 2021

This marking guideline consists of 8 pages.

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QUESTION 1

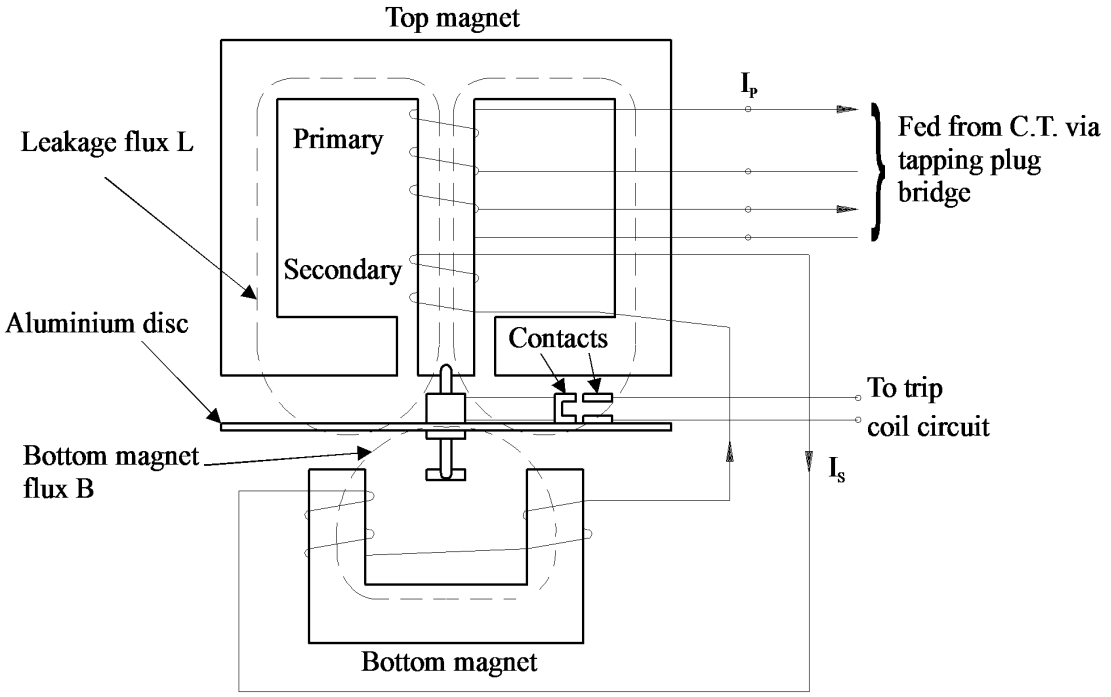
1.1
- The voltage required by the load
- The required current-delivering capacity
- The life expectancy of the cell
- Whether or not a rechargeable cell is required
- The storage life of the cell
- The relative costs of the various cells
- The internal resistance of the cell
- The physical size and mass of the cell
- The operating temperatures (Any 4 × 1) (4)

1.2
- Cell voltage
- Cell capacity
- Conservation of charge
- Ah and Wh efficiency
- Condition of plates
- Internal resistance
- Load test (Any 6 × 1) (6)

1.3 Floating charge it is when the battery is continually connected to a load and is designed to maintain a constant voltage throughout its load range. (3)
[13]

QUESTION 2

2.1

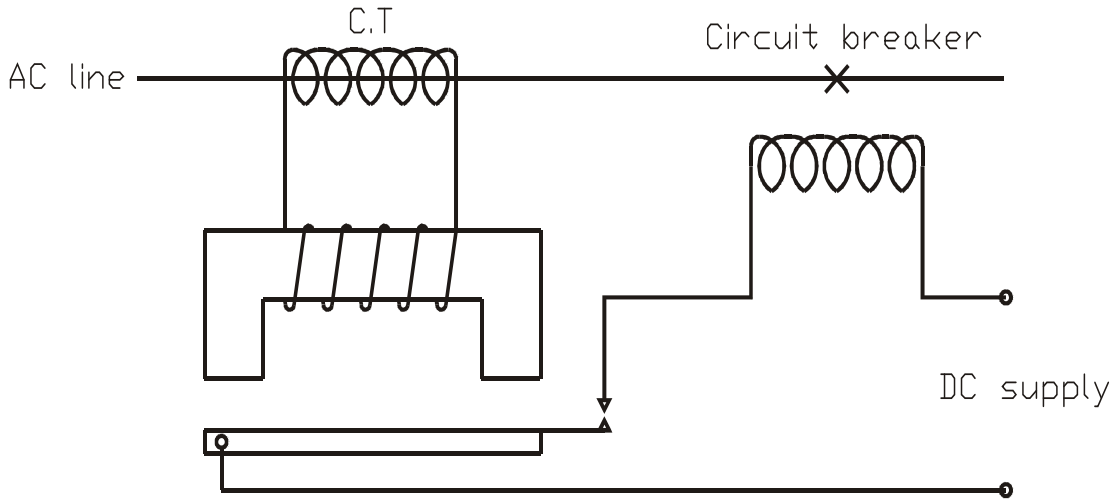


(6)

2.2
- Grading with reference to situation times only (time grading)
- By varying the current setting and working with constant saturation time
- By selective combination of saturation times and current setting to give the shortest possible operation time (time/current grading) (3)

2.3
- Reed relay
- Timer relay
- Overcurrent relay
- Undervoltage relay
- Thermal overcurrent relay
- Solenoid (6)

2.4



The relay may be used to protect any size of feeder by choosing an appropriate current transformer (CT) ratio.✓ The relay operating current can be altered by either adjusting the air gap or by having tapping on the relay coil.✓ When the latter method is used, a special tapping plug bridge is incorporated in the relay, which prevents the CT secondary from being open-circuited while the tapping is changed.✓ (6)

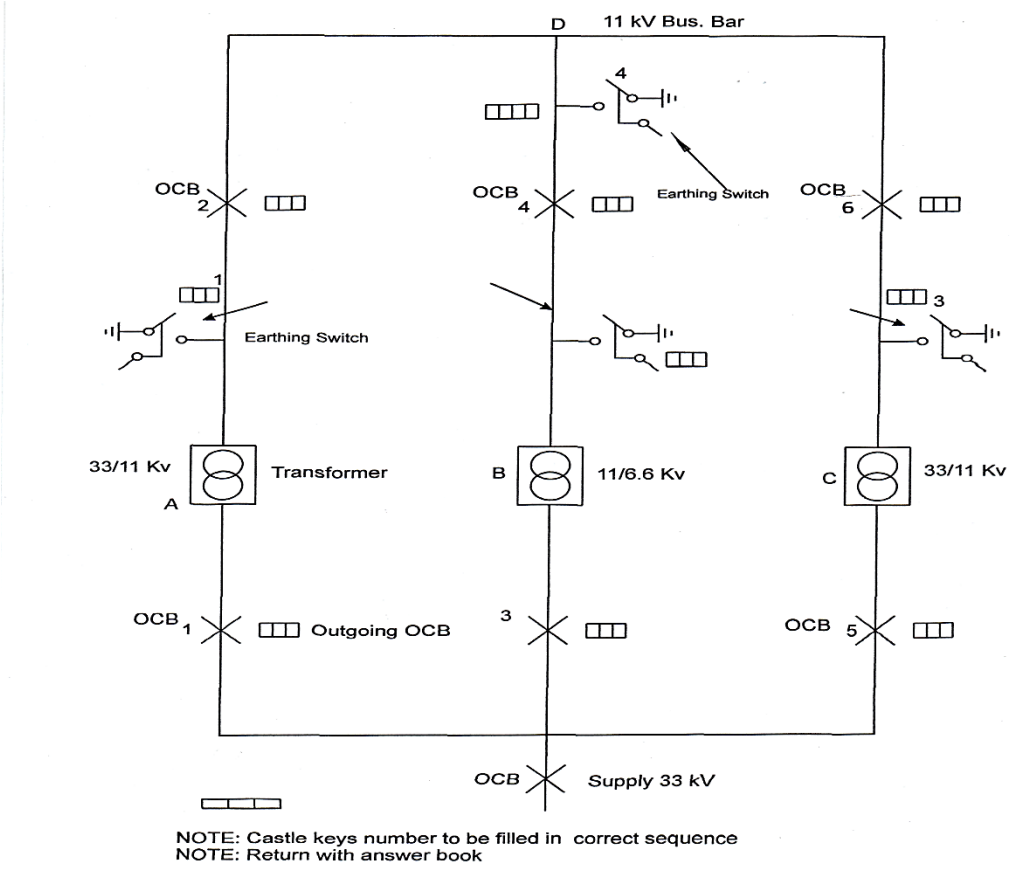
[21]

QUESTION 3

3.1
- To safeguard the supply
- To safeguard switchgears and other equipment
- To safeguard against overvoltage, lightning or switching surges
- To provide a path to earth
- To prevent the line current from flowing through the equipment (5)

3.2
- Transformer A: When OCB 1 and OCB 2 are closed, keys A1 and A2 are engaged.
- When OCB 1 and OCB 2 are opened, keys A1 and A2 can be released and moved to the position of earth switch 1. Earth switch 1 can now be closed.
- Transformer A is now safe to work on.
- Transformer B: When OCB 3 and OCB 4 are closed, keys B3 and B4 are engaged.
- When OCB 3 and OCB 4 are opened, keys B3 and B4 can be released and moved to the position of earth switch 2. Earth switch 2 can be closed.
- Transformer B is now safe to work on.
- Transformer C: When OCB 5 and OCB6 are closed, keys C5 and C6 are engaged.
- When OCB 5 and OCB 6 are opened, keys C5 and C6 can be released and moved to the position of earth switch 3. Transformer C is now save to work on.
- Busbar: Release keys 7, 8 and 9 from earth switches 1, 2 and 3 and put them in the busbar earth switch.
- The earth switch can be closed and it is now safe to work on busbar section D.

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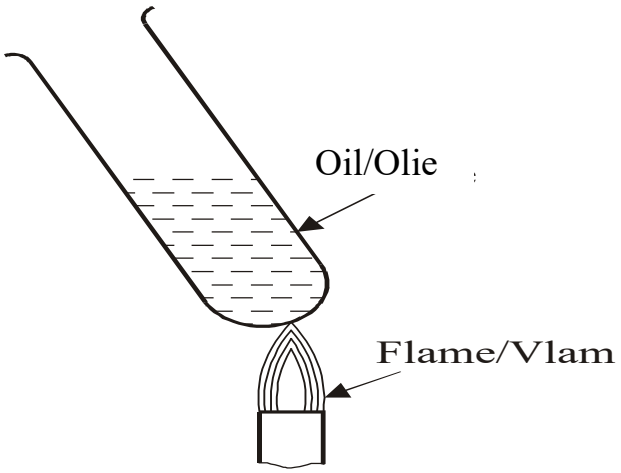


(10)

[15]

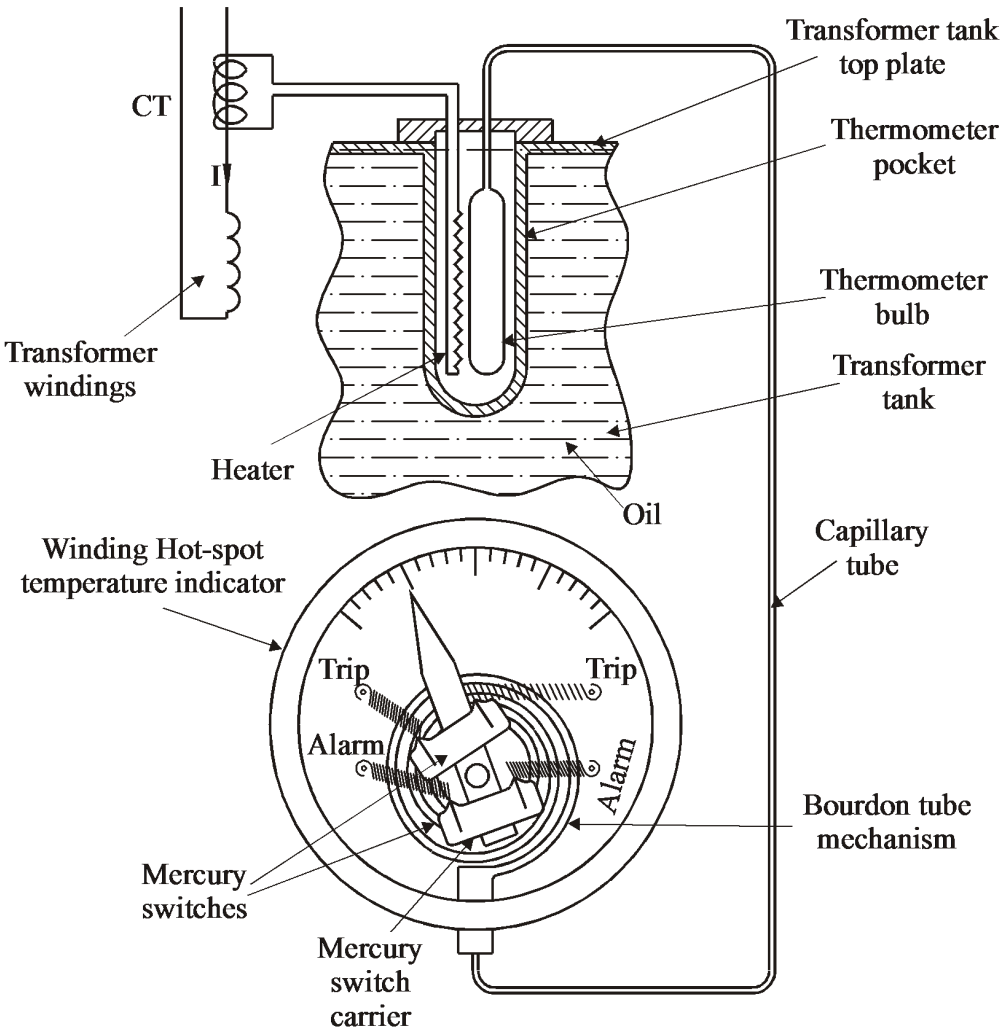
QUESTION 4

4.1 Fill a clean test tube with oil. Heat the oil rapidly until it boils. If water is present in the oil, a crackle sound will be heard.



(3)

4.2


CT
Transformer tank top plate
Thermometer pocket
Thermometer bulb
Transformer tank
Transformer windings
Heater
Oil
Capillary tube
Winding Hot-spot temperature indicator
Trip
Trip
Alarm
Alarm
Bourdon tube mechanism
Mercury switches
Mercury switch carrier

(7)

4.3
- They must have the same rating (kVA).
- They must have the same operating voltages.
- They must have the same phase rotation.
- They must be connected with the same polarity.
- They must be of the same vector group.
- The phase displacement angles must be the same.
- The per-unit impedance must be the same.
- They must have the same operating temperature. (Any 7 × 1) (7)

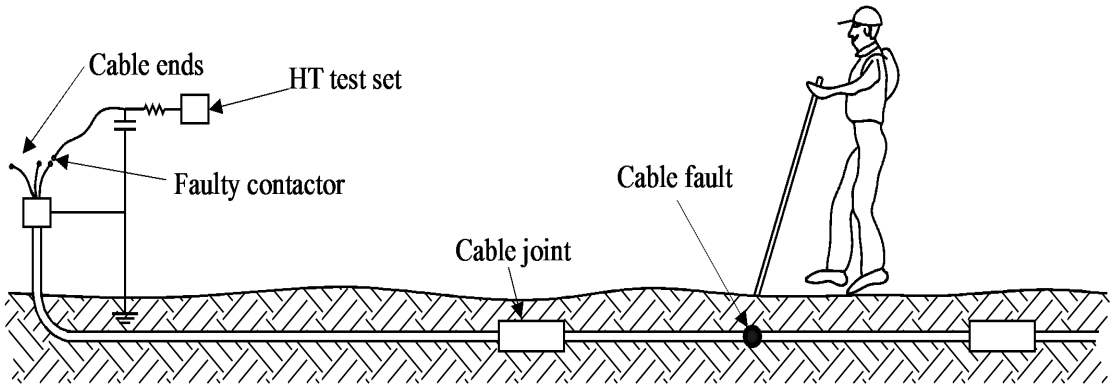
[17]

QUESTION 5

5.1
- Wrong type of material
- Wrong type of tape
- Wrong type of resin
- Wrong type of heat shrink
- Moisture
- Poor workmanship
- Faulty material (Any 6 × 1) (6)

5.2
- The conductor may be larger than that required to carry the current.
- The radius of the conductor may be increased at the point where the cores are closest to each other.
- The internal radius of the sheath and therefore the thickness of the insulation may be increased, but this makes the cable bulky and costly.
- The conductor can have a special shape to present a smoother surface. (4)

5.3

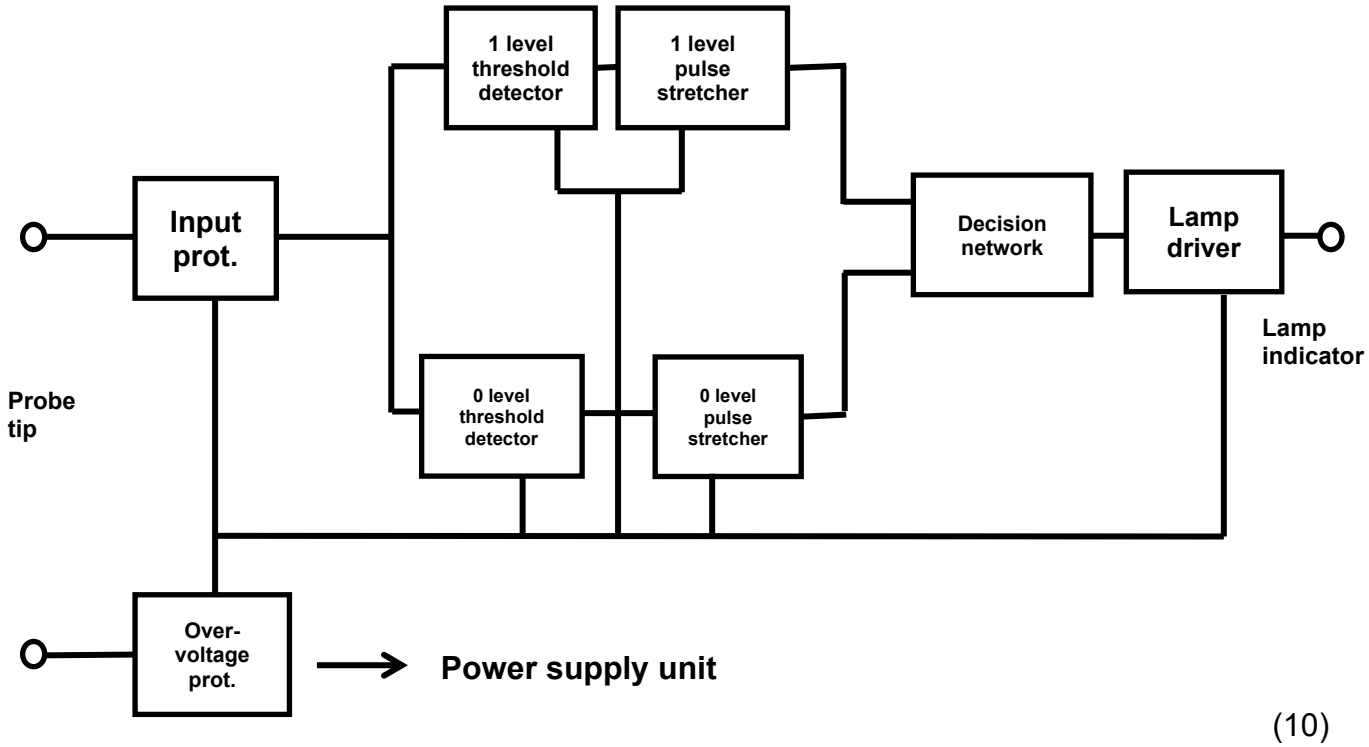


High tension from test source charges up C via R.✓ The faulty conductor voltages rise until they flash over the fault. The charge on C drops and again charges up from the supply via R.✓ There is therefore a regular flash at the fault. The fault-finder proceeds along the cable in the vicinity where the fault is suspected and listens for flashing, using a pointed stick with an amplifier.✓ (6)

[16]

QUESTION 6

6.1



(10)

6.2
- Control armature current
- Produce current-limiting operation
- Limit maximum armature current to a safe value (3)

6.3 By using a scope to check whether the signal is there for the triggering. If so, the fault will be in the main thyristor drive circuit; if not, the fault will be in the triggering side. (3)

6.4 A logic pulser is a digital test instrument used to inject a logic signal into a digital circuit. (2)

[18]

TOTAL: 100

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