higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

FAULT FINDING AND PROTECTIVE DEVICES N5

22 November 2024

This marking guideline consists of 6 pages.

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QUESTION 1

1.1 1.1.1 A capacitor is used to produce the phase angle necessary for starting.✓✓ (2)

1.1.2 A centrifugal switch is used to automatically disconnect the starting winding after the rotor has reached about 75% of full speed.✓✓ (2)

1.2 A thermal overload protection device disconnects the motor from the supply when an excessive heat is generated in the motor circuitry.✓✓ (2)

1.3
- No supply.✓
- Voltage too low.✓
- Overload.✓
- Insufficient torque.✓
- Open circuit on rotor winding.✓
- Brushes not marking contact.
- Mechanical load to big. (Any 5 × 1) (5)

1.4
- Make sure that the supply is interrupted.✓
- Verify that the circuit is dead.✓
- Isolate the circuit.✓
- Earth apparatus.✓
- Lock out and place safety notices.✓
- Ensure that the supply cannot be switched on accidentally.
- Only you can switch the supply on again. (Any 5 × 1) (5)

1.5 1.5.1 Brush holders – are used to hold the brushes securely in position to make contact with the commutator.✓✓ (2)

1.5.2 Slip-ring – is a conducting ring rotating with a winding and connected thereto, and serving to make connection with an external circuit by means of a brush or brushes.✓✓ (2)

[20]

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QUESTION 2

PROBLEMS	POSSIBLE CAUSE	POSSIBLE SOLUTION
Gradual wear of brushes	Normal.✓	Do not change type of grades of brushes.✓
Brush wear rapidly	Humidity below 6 grain/m^2 ✓	Humidity air with steam or water.✓
Wear, hot shunt and arcing	Wrong brush pressure. ✓	Adjust brush pressure.✓
Sparking	No film on commutator.✓	Leave, film will form in due time.✓
Brushes vibration	Brush box too far from commutator, brush angle wrong.✓	Adjust brush box 3 mm from commutator. Adjust brush box angle.✓

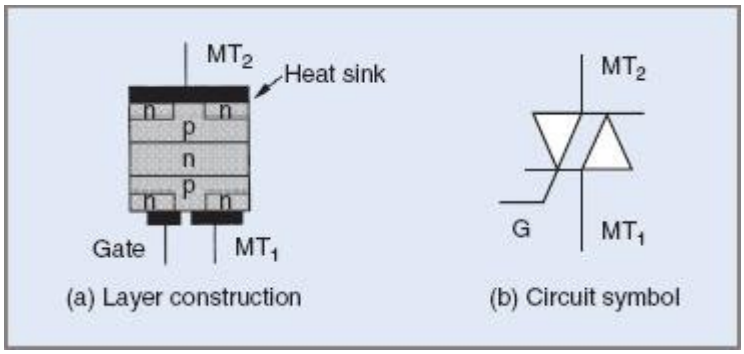
[10]

QUESTION 3

SCR (Silicon control rectifier)		TRIAC (Triode for alternating current)
3.1.1	A unidirectional device that conduct current in one direction.✓	A bidirectional device that conducts in both directions.✓
3.1.2	Triggered by a diode or UJ-transistor.✓	Triggered by a DIAC.✓
3.1.3	Polarity needs to be maintained.✓	Polarity is not important.✓
3.1.4	Use for DC power control.✓	Use for both AC and DC power control.✓
3.1.5	Operates in quadrant 1 only.✓	Operates best in quadrant 1 but they can be operated in all four quadrants.✓

(Any other relevant answer) (10)

3.2



(3 marks for construction
2 marks for symbol) (5)

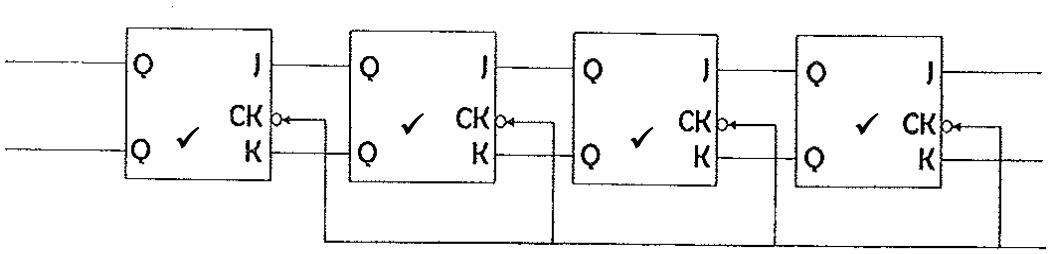
3.3
- Switch.✓
- Battery chargers.✓
- Light dimmers.✓
- UPS systems.✓
- Potable instrument and tool drives.✓
- Power control devices.
- Resistance heaters.
- Phase control rectifier.
- AC to DC power converter.

(Any 5 × 1) (5)
[20]

QUESTION 4

4.1 Counters ✓and shift register. ✓ (2)

4.2



(4)

4.3

S	R	Q	$\overline{Q}$	
0	0	Invalid		✓
0	1	1	0	✓
1	0	0	1	✓
		Q_n	$\overline{Q_n}$	✓

(4)

4.4 4.4.1 AND gate.✓ (1)
4.4.2 NOR gate.✓ (1)
4.4.3 Exclusive OR gate.✓ (1)

4.5

A	B	A+B	
0	0	0	✓
0	1	1	
1	0	1	✓
1	1	1	✓

(4)

4.6 4.6.1

$$\begin{array}{r} 101111_2 \\ 100101_2 \quad \checkmark\checkmark \\ +\ 110011_2 \\ \hline 10000111_2 \quad \checkmark\checkmark \end{array}$$

(4)

4.6.2

$$\begin{array}{r} 110001_2 \\ -\ 101011_2 \quad \checkmark \\ \hline 000110_2 \checkmark\checkmark \end{array}$$

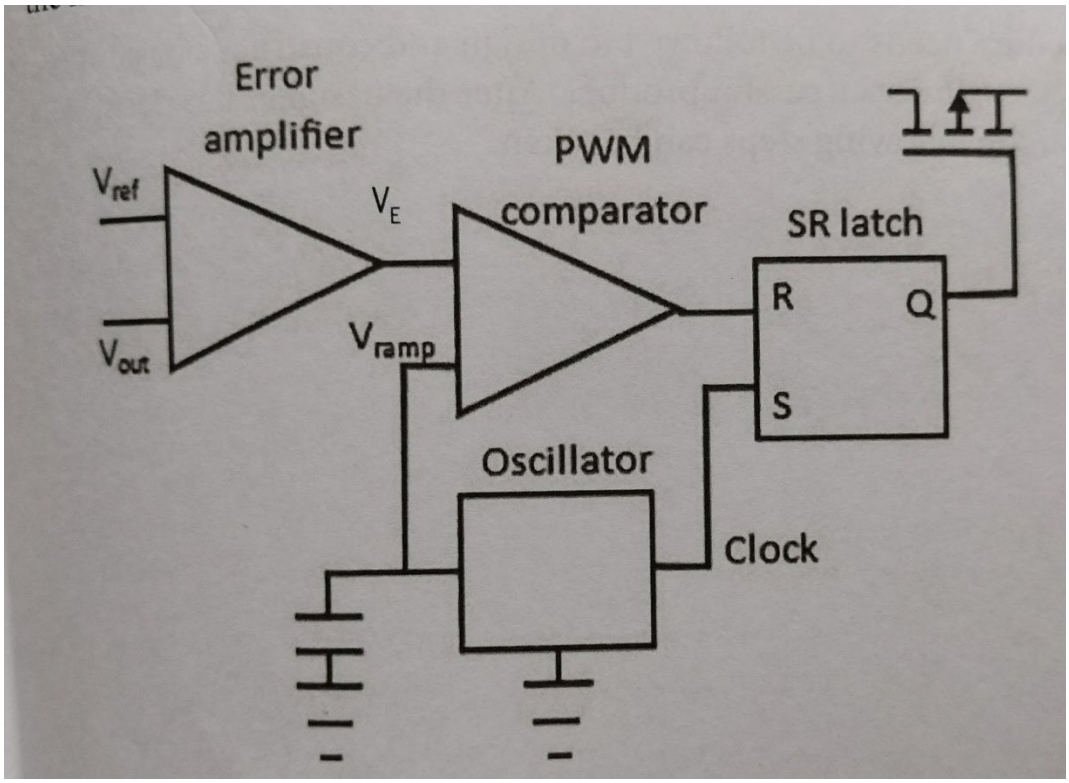
(4)
[25]

QUESTION 5

5.1
- Solar power system.✓
- Electric vehicles.✓
- Uninterruptible power supplies✓
- Air travel generation.✓
- Power generation and High voltage DC systems.✓
- Variable frequency drives.✓

(Any 6 × 1) (6)

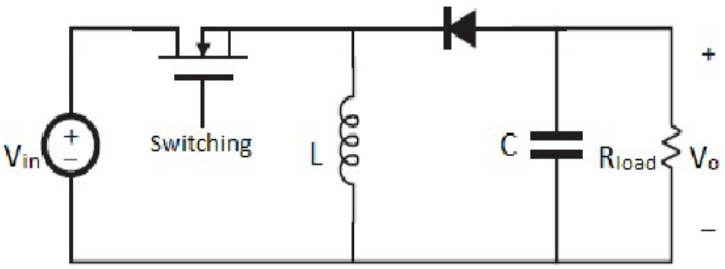
5.2



(Correct diagram 3 marks
Correct labelling 7) (10)

5.3 In the buck-mode the output voltage is lower than the supply voltage.✓✓✓ (3)

5.4



✓✓✓✓✓✓ (6)
[25]

TOTAL: 100

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