



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

INDUSTRIAL ELECTRONICS N6

5 August 2025

This marking guideline consists of 6 pages.

QUESTION 1

- 1.1 1.1.1 $T = R.C$
 $= 30 \times 10^3 \times 4 \times 10^{-6}$
 $= 0,12 \text{ seconds}$ (2)
- 1.1.2 $V_c = M_e.(1-e^{-t/T})$
 $114 = 120(1-e^{-t/0.12})\checkmark$
 $0,95 = e^{-t/0.12}\checkmark$
 $\ln 0,95 = \ln e^{-t/0.12}\checkmark$
 $-t = 0,12 \times (-0,0513)\checkmark$
 $T = 0,0062 \text{ seconds}\checkmark\checkmark$ (6)
- 1.2
 - Over damped
 - Critically damped
 - Under damped (2)

[10]

QUESTION 2

- 2.1 $\Delta R = \Delta t \times \Delta R \times \text{temperature coefficient}$
 $= (100 - 30) \times 2\,000 \times 0,002\checkmark$
 $= 280 \Omega\checkmark$
 $R_{THa} = \Delta R + \text{nominal resistance}$
 $= 280 + 2\,000$
 $= 2280 \Omega\checkmark$
 But $V_D = V_S \left(\frac{R_1}{R_1+R_2} - \frac{R_3}{R_3+R_4} \right)\checkmark$
 $= 6 \left(\frac{2000}{2000+2000} - \frac{2000}{2000+2280} \right)\checkmark$
 $= 6(0,5 - 0,467)\checkmark$
 $= 0,198 \text{ V}\checkmark$ (7)
- 2.2 $\frac{V_o}{V_i} = 1 + \frac{R_f}{R_m}$
 $R_f = R_m \left(\frac{V_o}{V_i} - 1 \right)\checkmark$
 $= 2\,000 \left(\frac{5}{0,198} - 1 \right)\checkmark$
 $= 48,505 \text{ k}\Omega\checkmark$ (3)

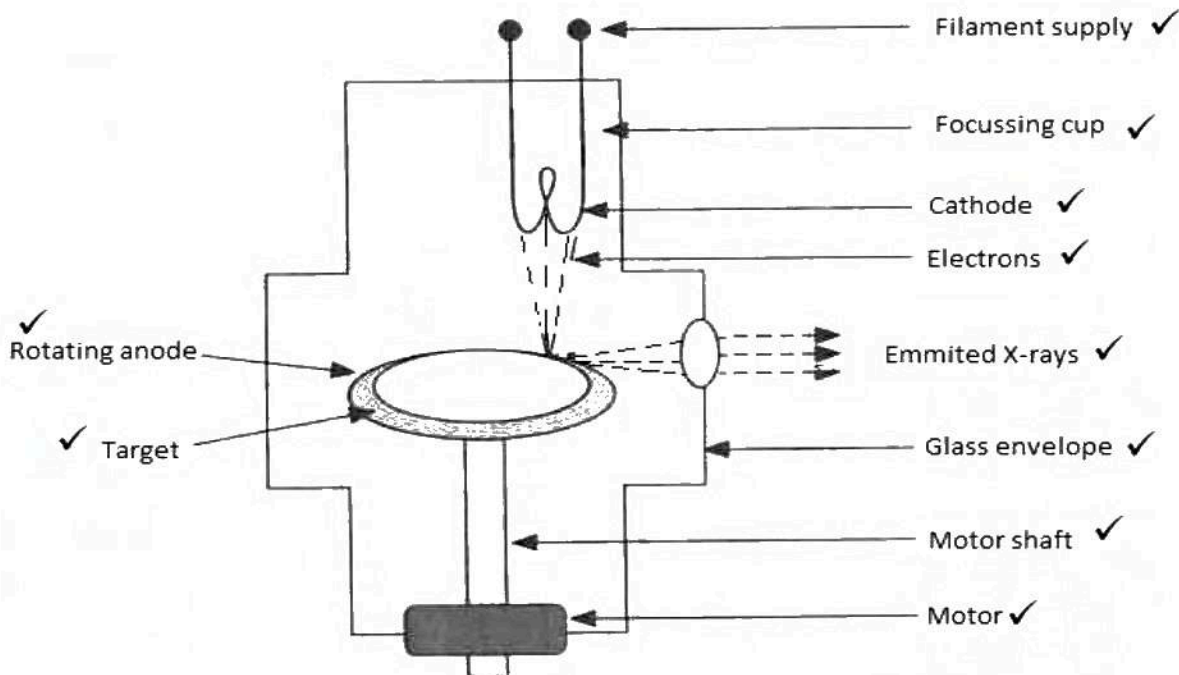
[10]

QUESTION 3

- 3.1 3.1.1 Capacitor
 3.1.2 Resistor
 3.1.3 Ultrasonic generator
 3.1.4 Power supply
 3.1.5 Coupling cone
 3.1.6 Heated tool tip
 3.1.7 DC bias winding

(7 × 1) (7)

3.2



(8)
[15]

QUESTION 4

- 4.1
- Image intensification employs an X-ray tube and a fluorescent screen but instead of the screen being viewed directly, a remote controlled television camera is focussed onto the image produced by the X-ray tube and the final viewing is done on a monochrome monitor with high resolution.
 - The image on the monitor screen is bright enough to be viewed in daylight, although subdued light is preferred.
 - The bright image on the screen is easy to interpret, making the detection of flaws in castings and other objects easier and quicker.
 - The fact that X-ray films no longer need to be developed speeds up the testing procedure.
 - Since remote controlled television cameras have been used to focus on the object, it has the added advantage of zooming in on any suspect area.

(Any 2 × 2) (4)

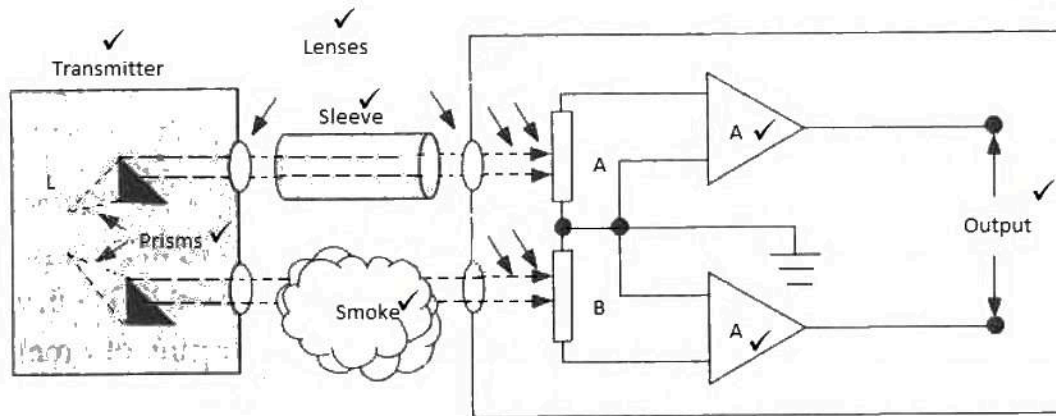
- 4.2
- Insulation resistance test – is to measure the resistance✓ value at a certain test voltage.✓✓
 - Withstand voltage test – is the application of high voltage✓ to a device being tested.✓✓

(2 × 3)

(6)
[10]

QUESTION 5

5.1



(Any 6 × 1)

(6)

- 5.2
- The safety device must be fail safe,✓ i.e. if the safety device itself is faulty, operation of the equipment should not be possible.✓
 - The operator should not be able to by-pass the safety device,✓ if, in his/her opinion, he/she can work faster or better without the safety device being operational.✓

(4)
[10]

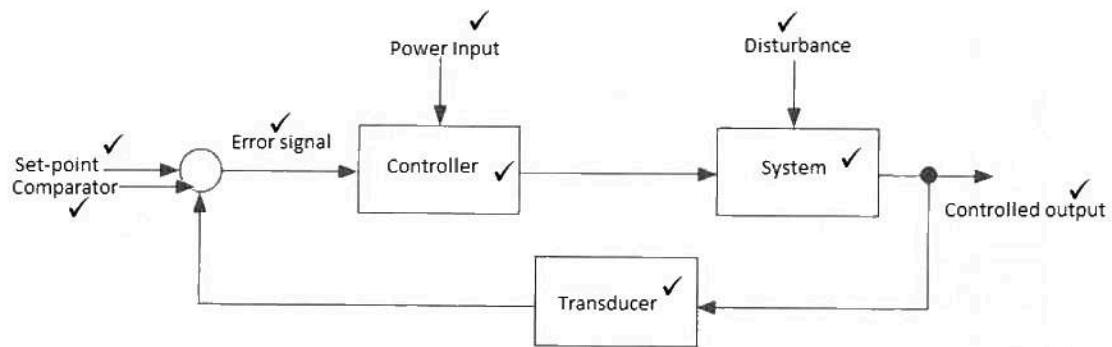
QUESTION 6

6.1

- Products can be modified on the production line by making changes to CAD system.
- The CAM system will automatically reproduce design changes on the production line.
- 24-hour productive production without 24 hours skilled supervision is possible.
- Machinery and plant can operate without skilled labour; subject to breakdowns, routine services and power failures.

(4)

6.2



(6)
[10]

QUESTION 7

- | | | |
|-----|--------|-----------------------------------|
| 7.1 | 7.1.1 | Supply |
| | 7.1.2 | Controller rectifier |
| | 7.1.3 | Inverter |
| | 7.1.4 | Trigger circuit |
| | 7.1.5 | Voltage/Frequency shaping network |
| | 7.1.6 | Motor |
| | 7.1.7 | Link-voltage level |
| | 7.1.8 | Error voltage amplifier |
| | 7.1.9 | Trigger circuit |
| | 7.1.10 | Speed adjust |

(10 × 1) (10)

- | | | |
|-----|-------|-------|
| 7.2 | 7.2.1 | True |
| | 7.2.2 | True |
| | 7.2.3 | True |
| | 7.2.4 | True |
| | 7.2.5 | False |

(5 × 1) (5)
[15]

QUESTION 8

- | | | |
|-----|--|-----|
| 8.1 | <ul style="list-style-type: none"> • Network 1 shows the system's start and stop function. • The push buttons are used to start and stop the system. • Output is stored in a memory M0,0 and is latched to the input. (Any 2 × 2) | (4) |
|-----|--|-----|

- 8.2
- Switches and push buttons
 - Sensing devices
 - Temperature switches
 - Vacuum switches
 - Level switches
 - Pressure switches
 - Photoelectric sensors
 - Condition sensors
 - Proximity sensors
 - Limit switches
- (Any 4 × 1) (4)
- 8.3
- Electrical engineering
 - Mechanical engineering
 - Chemical engineering
 - Mining
 - Instrumentation
- (Any 2 × 1) (2)
- [10]**

QUESTION 9

- 9.1
- L293D has the advantages of strong driving capability and ease of use.
 - At the same time, its high degree of integration can reduce the area of the circuit board and make the circuit design more compact.
- (2 × 2) (4)
- 9.2
- PIN 1 – Enable 1 & 2
PIN 2 – Input 1
PIN 3 – Output 1
PIN 4 – Ground
- (4)
- 9.3
- 600 mA or 0,6 A
- (2)
- [10]**
- TOTAL: 100**