



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE INSTRUMENT TRADE THEORY N3

12 April 2021

This marking guideline consists of 7 pages.

QUESTION 1

- 1.1 1.1.1 True
 1.1.2 True
 1.1.3 True
 1.1.4 True
 1.1.5 True

(5 × 1) (5)

- 1.2 • Maximum gauge factor.
 • Maximum resistance per unit length.
 • Maximum melting point.
 • Minimum resistance temperature coefficient.
 • Minimum coefficient of linear expansion.
 • Minimum thermal-electrical effect at connections.
 • Optimum flexibility and easily soldered.

(Any 5 × 1) (5)

- 1.3 1.3.1 Piezoelectric transducer

(1)

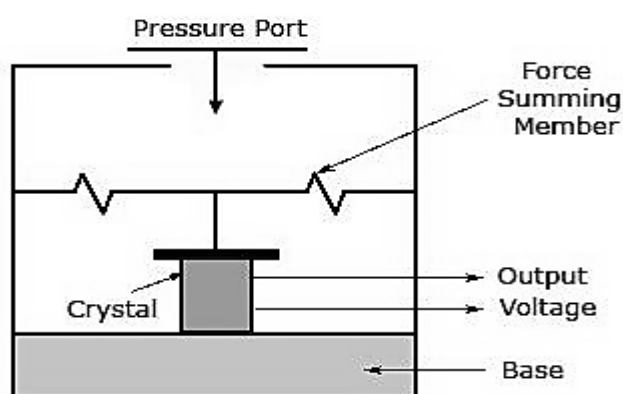
- 1.3.2 • It can generate EMF
 • Linear output
 • Rugged
 • Small size
 • Suitable for dynamic response

(5)

- 1.3.3 • High impedance output.
 • Affected by temperature variations.
 • With long leads, error signals are generated.

(3)

- 1.3.4



Piezo-Electric Transducer

Correct drawing = 3
 Crystal = 1
 Pressure port = 1
 Diaphragm = 1

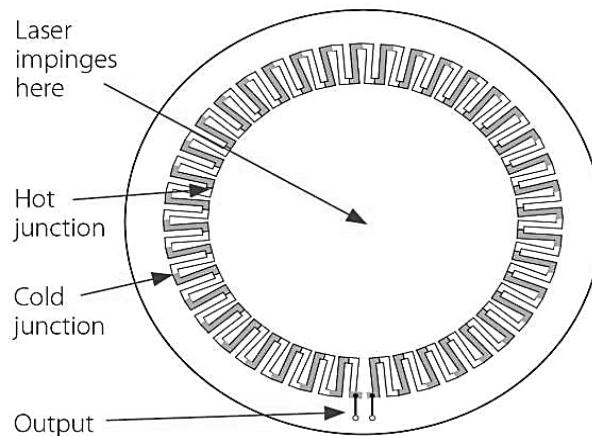
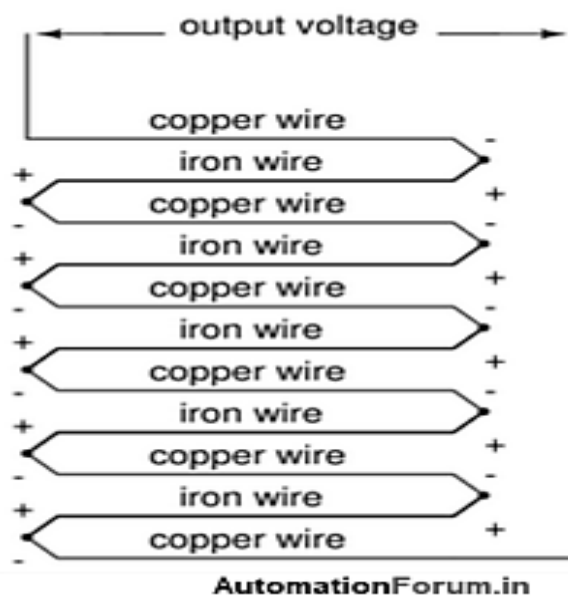
(6)
[25]

QUESTION 2

- 2.1 2.1.1
- The device consists of a number of thermocouples connected in series.
 - When exposed to heat, voltage is generated from each thermocouple.
 - The voltage is added to give a total voltage.

(3)

2.1.2

**OR**

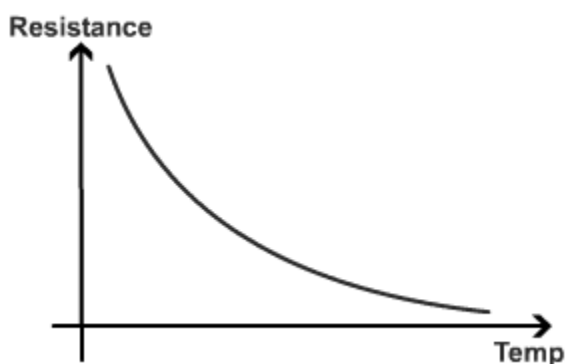
(5)

2.2 2.2.1 PTC thermistor



Graph = 2
Labelled axis = 1

2.2.2 NTC thermistor



Graph = 2
Labelled axis = 1

(2 × 3) (6)

- 2.3 2.3.1
 - No direct contact with the heated body is necessary.
 - The body may be either moving or stationary.
 - The measurement is relatively independent of the distance from the heated body.
 - Low temperatures may also be measured, provided a sufficiently sensitive element is employed to measure the small amounts of radiation.

(Any 3 × 1)

- 2.3.2
 - It is expensive.
 - Your temperature reading may be a little inaccurate.
 - You need specific pyrometers for measuring different materials.
 - Dust, smoke, fog, steam, etc. may affect your readings.
 - A dirty lens will cause inaccurate readings.

(Any 3 × 1)

(2 × 3) (6)

2.4	2.4.1	G
	2.4.2	I
	2.4.3	C
	2.4.4	D
	2.4.5	F

(5 × 1) (5)
[25]

QUESTION 3

3.1	3.1.1	Electrical supply
	3.1.2	Electrical power
	3.1.3	Primary element
	3.1.4	Measured variable

(4 × 1) (4)

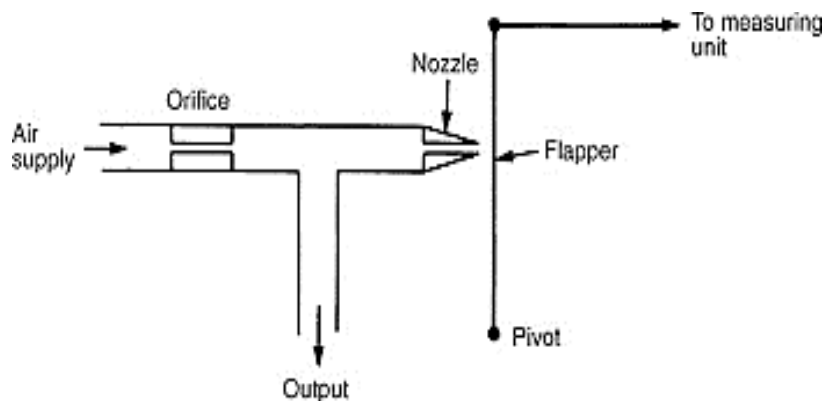
- 3.2
- Voltage telemetering
 - Current telemetering
 - Ratiometer telemetering
 - Conductance telemetering
 - Position telemetering
 - Impulse telemetering
 - Frequency telemetering
 - Resonance impedance telemetering

(Any 5 × 1) (5)

- 3.3
- Large time lag
 - Pressure drop
 - Leakages
 - Limited range
 - Nozzle may be blocked by dirty air
 - Output not linear

(Any 4 × 1) (4)

3.4



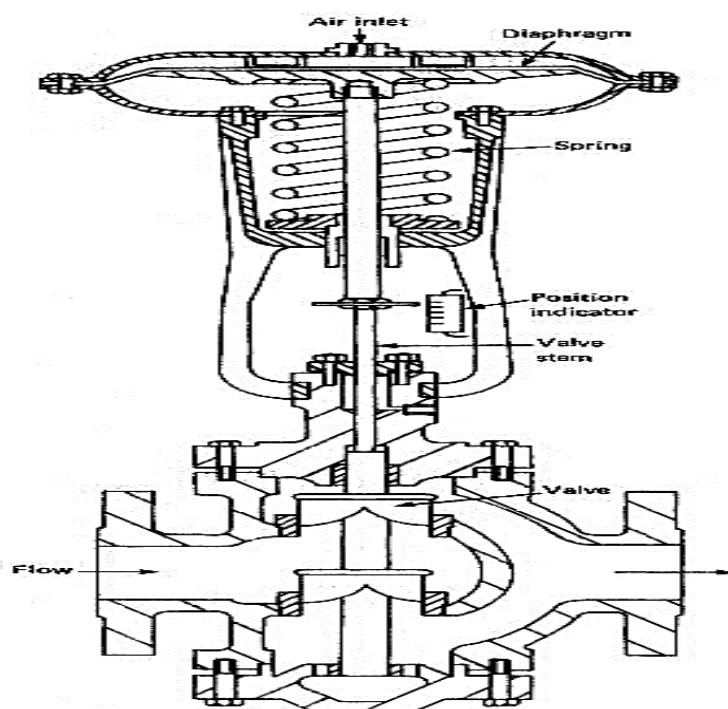
Correct drawing = 3
Flapper and nozzle = 1
Air supply = 1
Output = 1 (6)

- 3.5 When a flapper is completely away from the nozzle, there is a high flow out of the nozzle, ✓ creating a low pressure at the output receiver. ✓ When the flapper seals the nozzle, the output pressure builds up ✓ to supply pressure which is then a small flow from the nozzle ✓ and a high pressure to the output receiver. The reason for a restriction is that when the flapper is away from the nozzle, there is a large pressure drop. ✓ If the flapper is near the nozzle, there is a small pressure drop across the restrictor. ✓

(6)
[25]

QUESTION 4

4.1



Spring = 1
Valve stem = 1
Diaphragm = 1
Direction of flow = 1
Inlet = 1
Correct drawing = 4

(9)

- | | | |
|-----|-------|---|
| 4.2 | 4.2.1 | A change in the amount which must be processed |
| | 4.2.2 | The function to be monitored |
| | 4.2.3 | The point at which the controller actually regulates the process |
| | 4.2.4 | The method of making a process perform without the necessity of operator intervention |
| | 4.2.5 | The difference between the value of the measured signal and the set point |

(5 × 1) (5)

4.3 4.3.1 Fail to keep up with others in movement or development

OR

Delay between change in a process and realisation of change in the output

(2)

4.3.2 Distance-velocity lag

- It represents the delay which occurs between the change in process material at the correcting element and the arrival of this changed material at the detecting element.
- Transfer lag
It concerns the capacity and the resistance of a process.

OR

Time it takes to transfer matter from one place to another.

- Process lag
The delay or retardation in the response of the controlled variable at a point of measurement to a change in value of the manipulated variable.

(3 x 3)

(9)

[25]

TOTAL: 100