



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE
NATIONAL CERTIFICATE
INSTRUMENT TRADE THEORY N2
1 December 2023

This marking guideline consists of 7 pages.

QUESTION 1

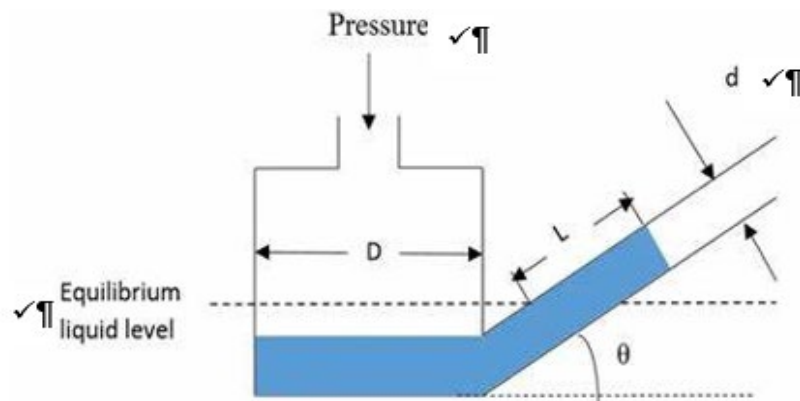
- 1.1 1.1.1 E
 1.1.2. F
 1.1.3 H
 1.1.4 B
 1.1.5 G
 1.1.6 L
 1.1.7 I
 1.1.8 A
 1.1.9 C
 1.1.10 D

(10 × 1) (10)

- 1.2 1.2.1 True
 1.2.2. True
 1.2.3 True
 1.2.4 False
 1.2.5 False

(5 × 1) (5)

1.3



2 marks for the correctness of the sketch

(5)

1.4 **Given data:**

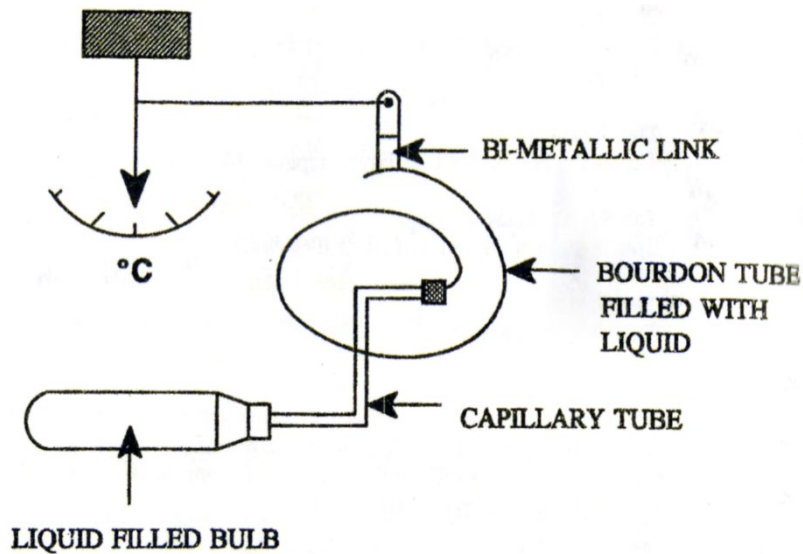
$$\begin{aligned}\theta &= 45^\circ \\ A_1 &= 0.05 \text{ m}^2 \\ A_2 &= 0.0009 \text{ m}^2 \\ L &= 29 \text{ cm}\end{aligned}$$

$$\begin{aligned}\Delta P &= \rho g L \left(\sin \theta + \frac{A_2}{A_1} \right) \\ &= 13\,600 \times 10 \times 0.29 \left(\sin 45 + \frac{0.0009}{0.05} \right) \checkmark \\ &= 39\,440 \times 0.7251067812 \checkmark \\ &= 28\,598.211 \text{ pa} \\ &= 28\,598 \text{ Kpa} \checkmark \checkmark\end{aligned}$$

(5)
[25]

QUESTION 2

2.1



2 marks for the correctness of the sketch
4 marks for any correct labelling

(6)

2.2

- Narrow spans can be measured.
- Speed of response is fast.
- Linear output.
- No need for cold junction compensation.

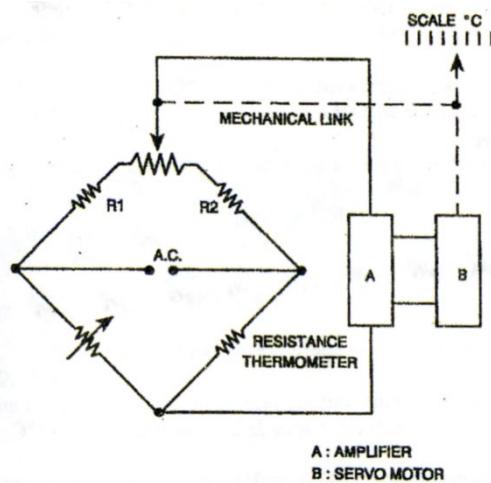
(4)

2.3

- Liquid
- Vapour
- Gas
- Mercury

(4)

2.4



3 marks for the correctness of the sketch
4 marks for any correct labelling

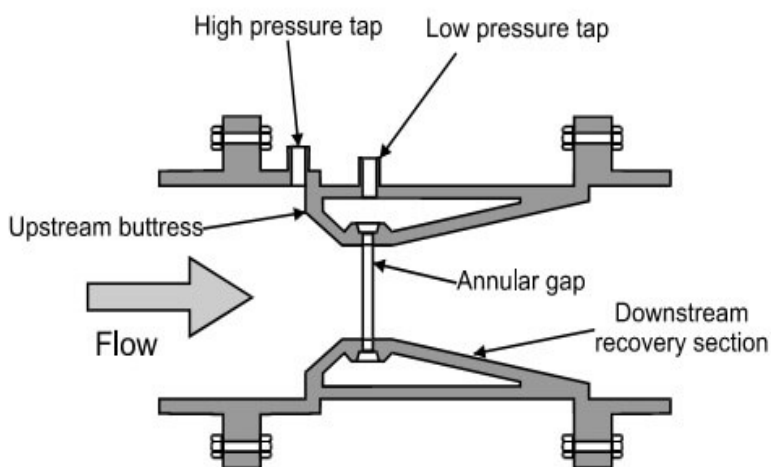
(7)

- 2.5 This law states that in a thermo-electric circuit consisting of two different metals and their junctions at T_1 and T_2 respectively, ✓ the e.m.f. is not altered if one or both of the junctions are opened ✓ and one or more different types of metals placed between providing that the junctions at temperature T_1 ✓ are kept at temperature T_1 and the junction at temperature T_2 are kept at temperature T_2 . ✓

(4)
[25]

QUESTION 3

- 3.1 3.1.1



Dall Tube Flow Meter

InstrumentationTools.com

2 marks for the correctness of the sketch

4 marks for any correct labelling

(6)

- 3.1.2 This is a short version of a venturi tube with a very narrow throat area. The throat joins the inlet and outlet cones together. ✓ The pressure-regaining factor is greater than that of the venturi tube. A sharp step is made by having the inlet throat diameter smaller than the pipe diameter. ✓ This step will thus cause an increase in pressure, and this is the exact position of the upstream tapping. ✓ The upstream tapping thus measures the impact pressure, due to the step, as well as the static pressure in the pipe. ✓ The downstream tapping is made where the inlet and outlet cones join (the throat). The pressure at this point is measured using a throat slot. ✓

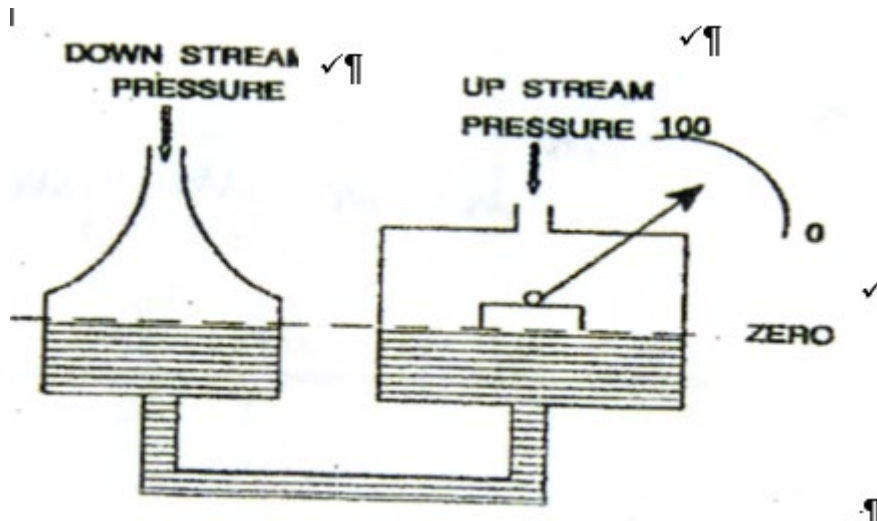
(5)

- 3.2
- Oscillating piston
 - Sliding vane type
 - Nutating disc type
 - Reciprocating piston type

(Any 3 × 1)

(3)

3.3



2 marks for the correct sketch
3 marks for correct labelling.

(5)

3.4 Vena-contracta – is the point at which the flow rate reaches its maximum value✓✓ and pressure is at a minimum.✓

(3)

3.5

- Linear output
- Because of the placement of the electrodes there is no obstruction against the flow
- Can measure flow in both directions
- Can handle corrosive fluids and slurries

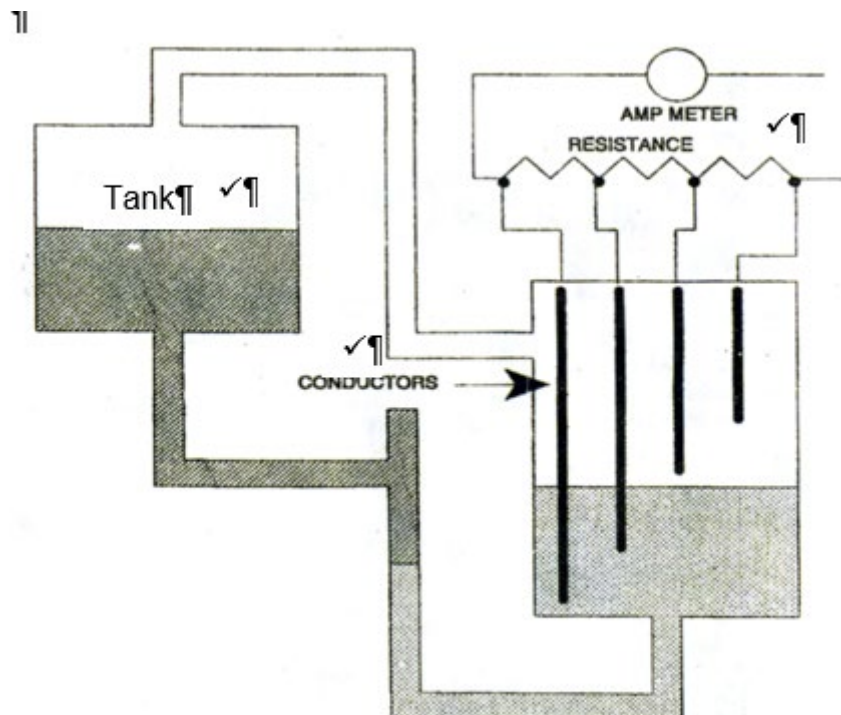
(Any 3 × 1)

(3)

[25]

QUESTION 4

4.1



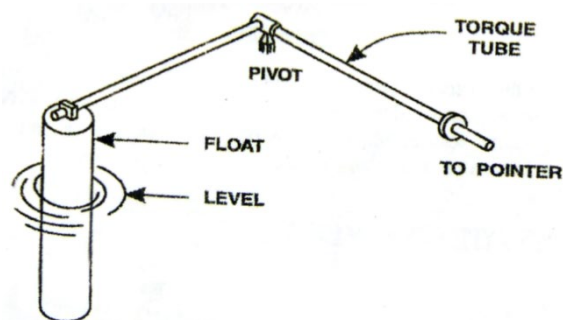
2 marks for the correct sketch

3 marks for correct labelling

The instrument contains a U-tube manometer, ✓ which is manufactured from steel and can withstand high static pressures. ✓ One leg of the manometer contains vertical conductors that serve as tapping resistance in the main unit of the instrument. ✓ When the level rises or falls, the resistance either increases or decreases accordingly, ✓ which will be detected by an external circuit. ✓

(10)

4.2

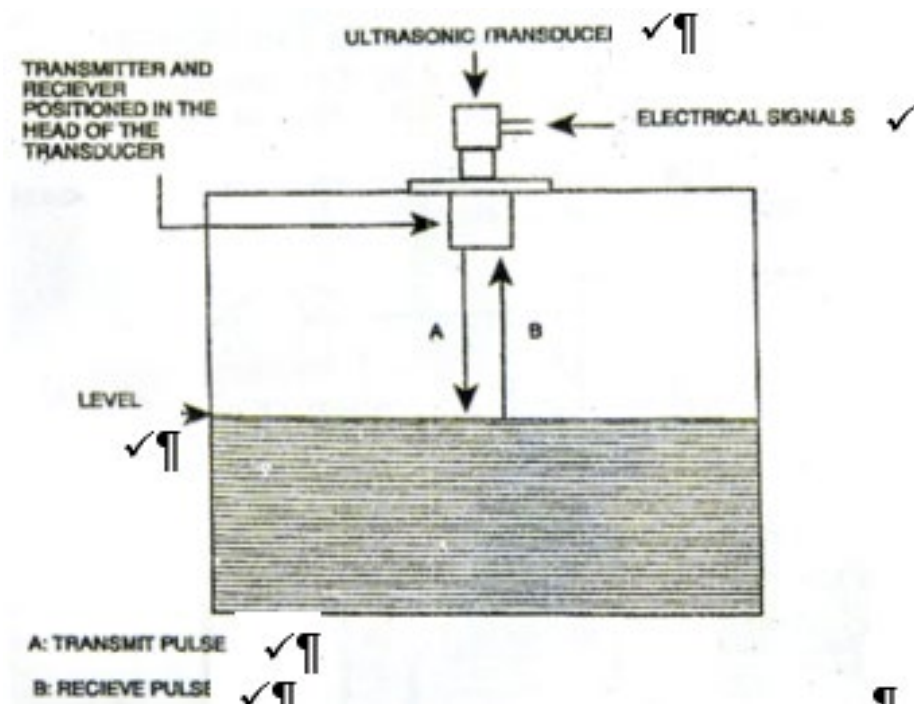


3 marks for any correct labelling

2 marks for the correctness of the sketch

(5)

4.3



2 marks for correct of the sketch.

5 marks for correct labelling.

Operation

The time it takes for the pulse to move from the transmitter✓ and be reflected back to the receiver✓ is an indication of the level in a tank.✓

(10)

[25]

TOTAL: 100