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.

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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

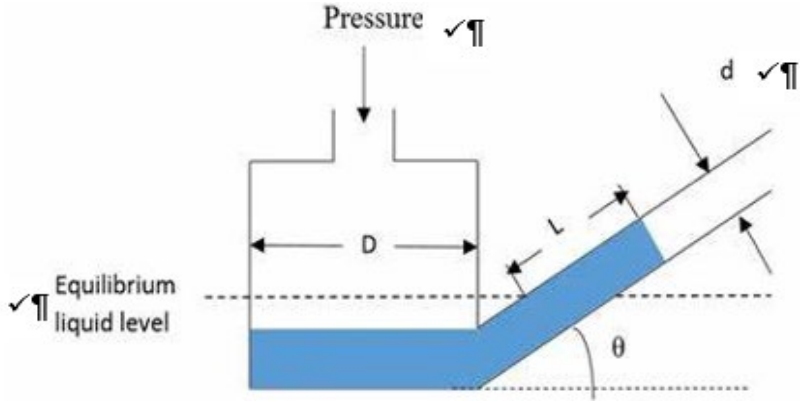
(10 × 1) (10)

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:**

$\theta = 45^0$
$A_1 = 0.05\ m^2$
$A_2 = 0.0009\ m^2$
$L = 29\ cm$

$$\Delta P = \rho g L(\sin\theta + \frac{A_2}{A_1})$$

$$= 13\,600 \times 10 \times 0.29\ (\sin 45 + \frac{0.0009}{0.05}) \checkmark$$

$$= 39\,440 \times 0.7251067812 \checkmark$$

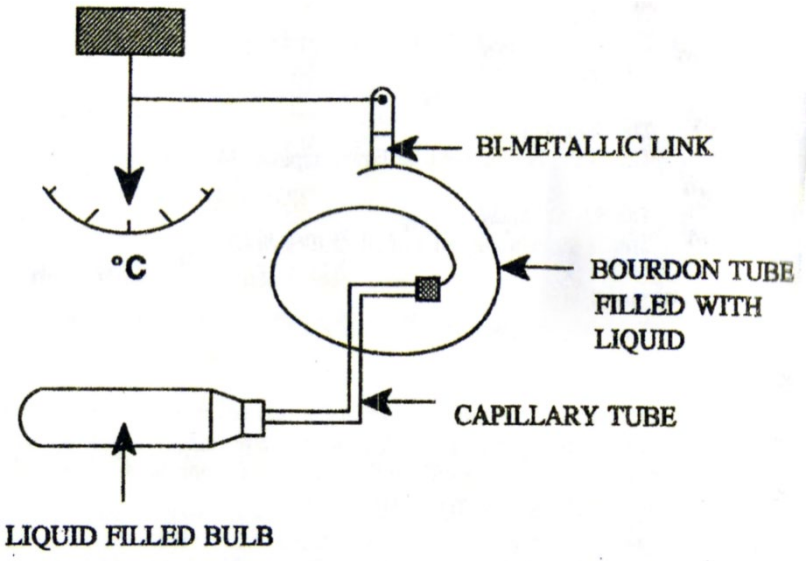
$$= 28\,598.211 pa$$

$$= 28\,598\ Kpa \checkmark\checkmark$$

(5)
[25]

QUESTION 2

2.1

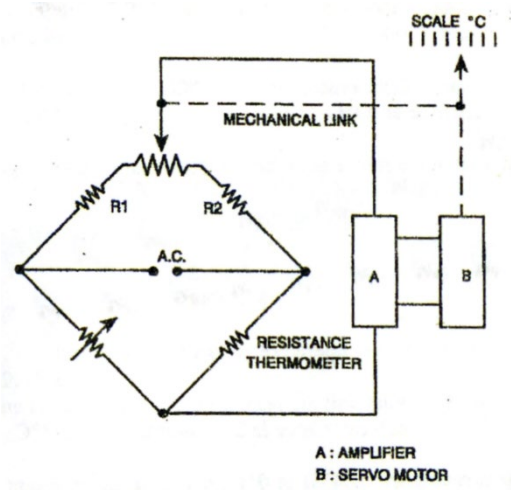


2 marks for the correctness of the sketch
4 marks for any correct labelling (6)

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



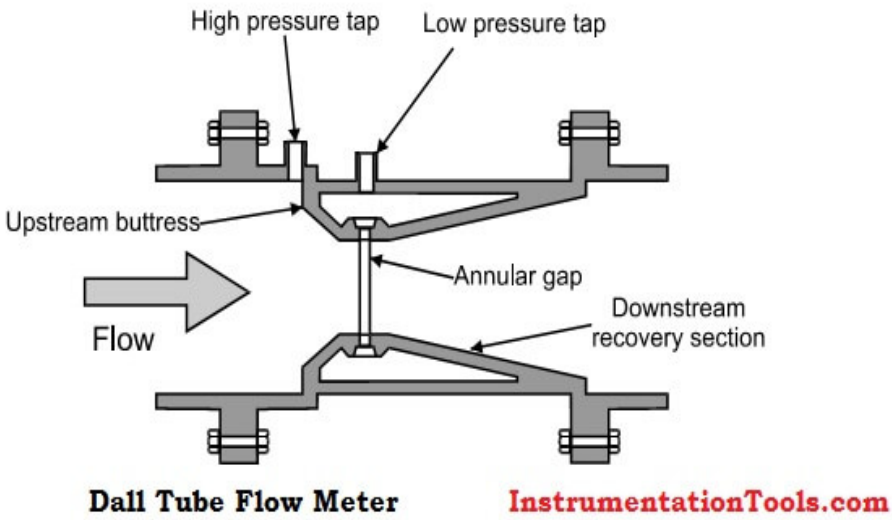
3 marks for the correctness of the sketch
4 marks for any correct labelling (7)

2.5 This law states that in a thermo-electric circuit consisting of two different metals and their junctions at T1 and T2 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 T1✓ are kept at temperature T1 and the junction at temperature T2 are kept at temperature T2.✓ (4)

[25]

QUESTION 3

3.1 3.1.1

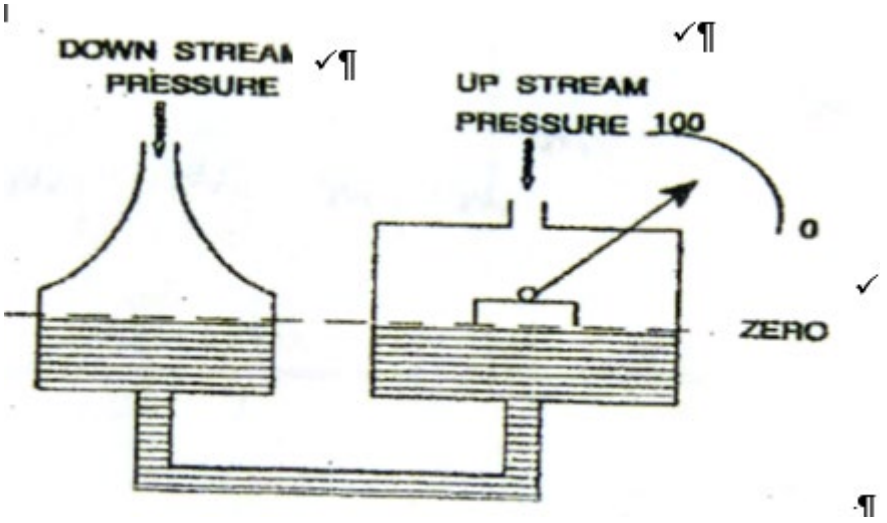


2 marks for the correctness of the sketch
4 marks for any correct labelling (6)

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 tire 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)

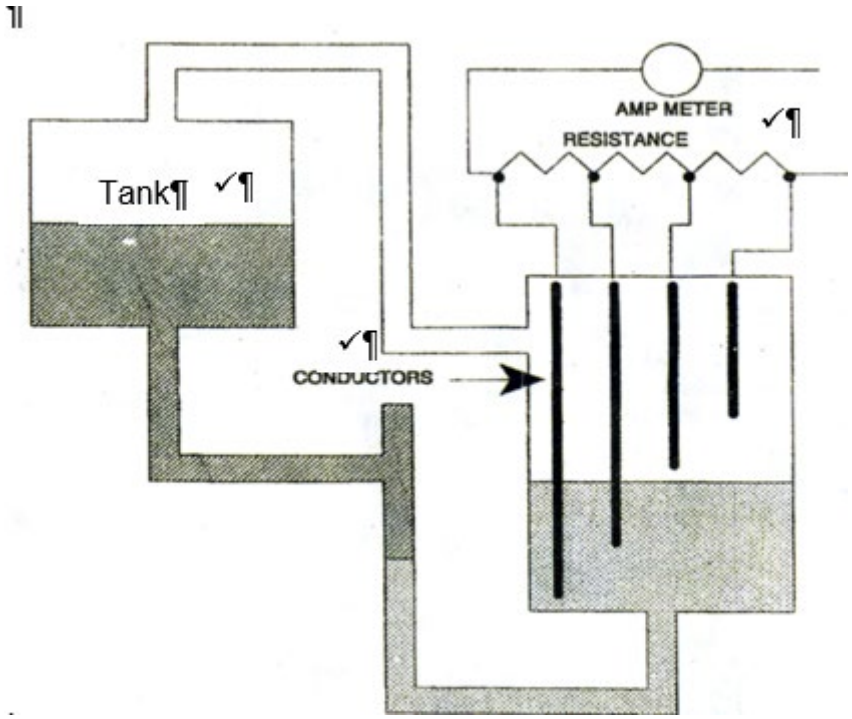
3.4 Vena-contracta – is the point at which the flow rate reaches its maximum value✓✓ and pressure is at a minimum.✓ (3)

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

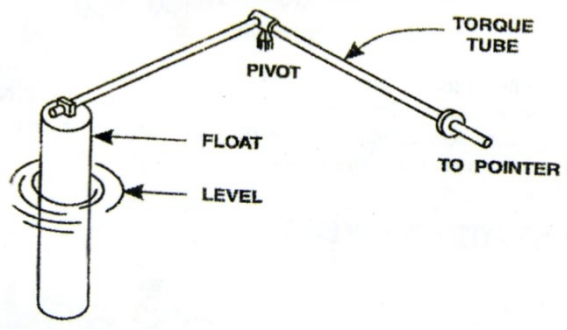
4.1



2 marks for the correct sketch
3 marks for correct labelling

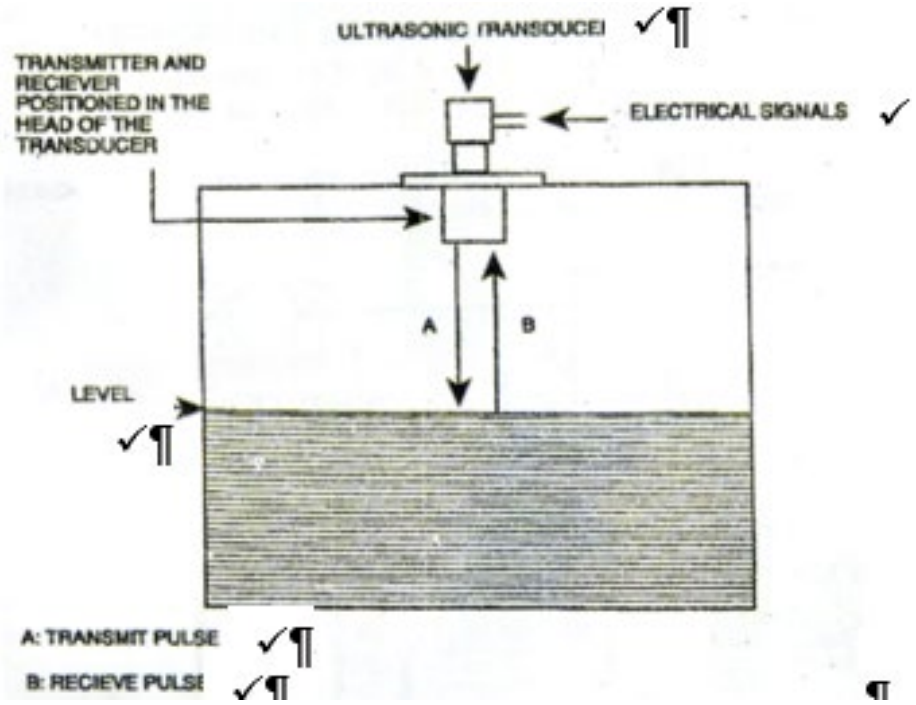
The instrument contains a U-tube manometer,✓ which is manufactured from steel and can withstand high static pressures.✓ One leg of the manometer contains vertical conductors that serve as tapping resistance in the main unit of the instrument.✓ When the level rises or falls, the resistance either increases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

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