higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

INSTRUMENT TRADE THEORY N2

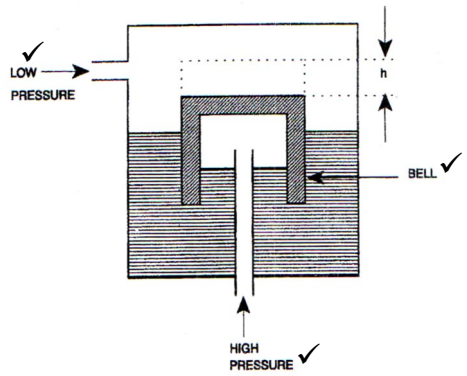
24 November 2022

This marking guideline consists of 6 pages.

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QUESTION 1

1.1

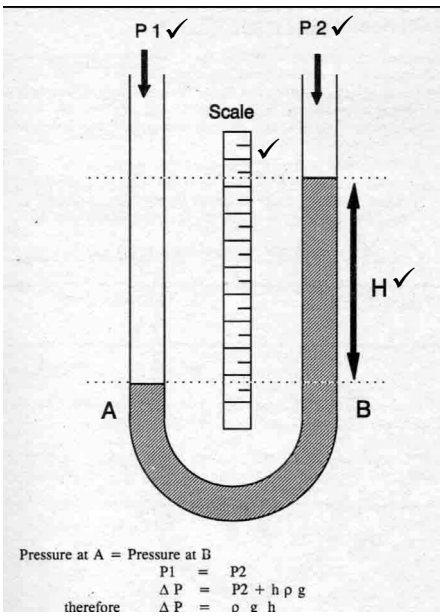


The liquid covers the open end of the bell and acts as a seal forming two chambers.✓ Gravity provides the controlling force. The higher pressure is connected to the inside and the lower pressure to the outside of the bell.✓ As the bell rises there is less of it immersed in the sealing fluid, so that the upward force on it due to buoyancy is reached.✓ The weight will therefore increase. (2 for labelling + 2 for sketch) (7)

1.2
- Bronze
- Stainless steel
- Brass
- Steel (4)

1.3
- Temperature
- Radium of the bend
- Total tube length
- Wall thickness of the tube
- Material of the tube (5)

1.4



(2 for labelling + 2 for sketch) (4)

1.5 $d = 30\ mm = 0{,}03\ m$
$P = 120\ kPa$
$m = ?$
$A = \frac{\pi d^2}{4}$
$= \frac{\pi(0{,}03)^2}{4}$
$= 0{,}000706858\ m^2$✓

$$P = \frac{mg}{A}$$
$$120 \times 10^3 = \frac{m \times 10}{0{,}000706858}$$✓

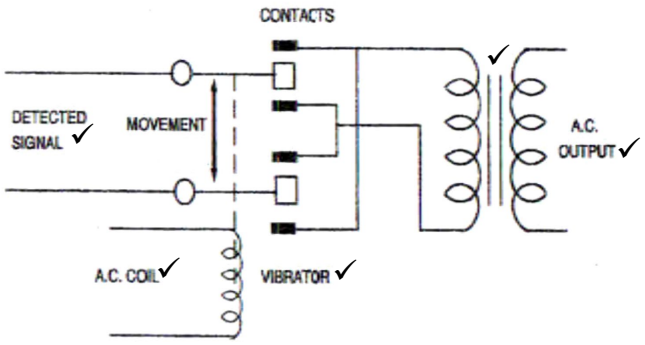
$$m = \frac{120 \times 10^3 \times 0{,}000706858}{10}$$✓

$m = 8{,}482\ kg$✓✓ (5)
[25]

QUESTION 2

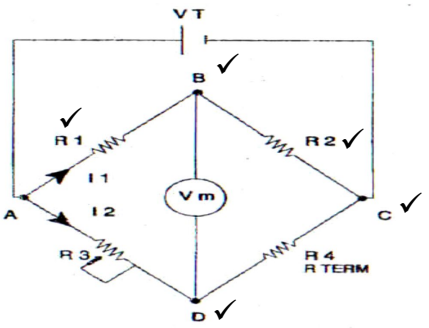
2.1 It is the scaling between two fixed values or points✓ with a resistance thermometer. It is the difference in resistance between 0 °C and 100 °C.✓✓ (3)

2.2



(3 for labelling + 2 for sketch) (5)

2.3



(3 for labelling + 2 for sketch) (5)

2.4
- Needs standardisation
- Lead-wire resistance added to the thermometer giving a false temperature reading (2)

2.5
- Factors affecting the stability of thermocouple alloys such as evaporation, diffusion (drift), oxidation
- Corrosion and contamination
- Errors introduced during fabrication and assembly
- Installation errors such as changing of thermocouples or changing immersion depth
- Reference junction errors (5)

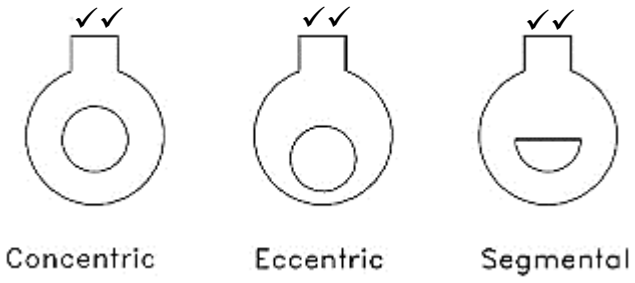
2.6
2.6.1 0 °C
2.6.2 273 K
2.6.3 Boiling point of water
2.6.4 373 K
2.6.5 212 °F

(5 × 1) (5)
[25]

QUESTION 3

3.1
- Concentric type
- Eccentric type
- Segmental type (3)

3.2



(6)

3.3 If a tube is placed in a stream,✓ and the flow has a velocity V1 at a pressure P1, the fluid particles are decelerated✓ as the fluid approaches the body✓ until the velocity V2 is zero. At this point the pressure increases to P2.✓ If the pressure difference (P2 – P1) can be measured,✓ the velocity of the fluid can be found.✓ (6)

3.4
3.4.1 Reciprocating piston
3.4.2 Oscillating piston
3.4.3 Nutating disc

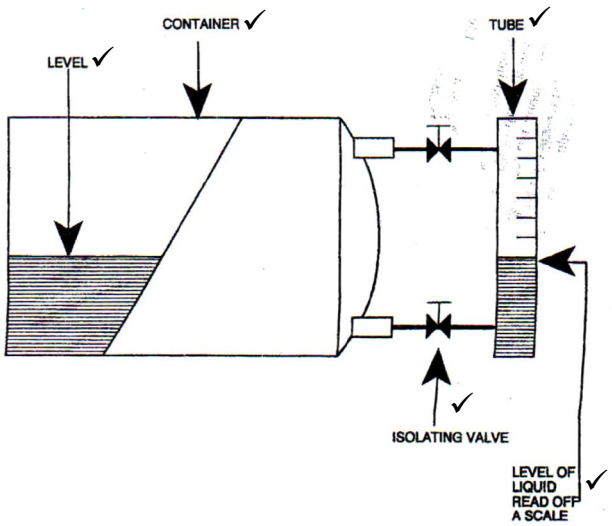
(3 × 2) (6)

3.5
- Weight of the vane
- Force due to the liquid
- Reaction at the pivot (Any 2 × 2) (4)

[25]

QUESTION 4

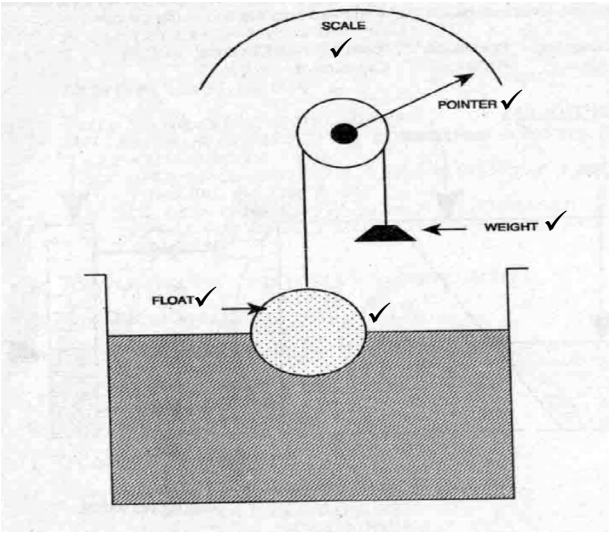
4.1



(3 for labelling + 2 for sketch)

The level in the tank and the level in the sight glass are at the same height.✓ The level is read off the scale on the tube.✓ The tube is made of a transparent material usually glass or plastic. When very high pressures and temperatures need to be measured,✓ the sight glass is made from metal with toughened glass so as to observe the level.✓ A ball valve is sometimes installed at the bottom of the tube for cleaning purposes and isolating valves to close off the sight glass in emergencies or when the sight glass breaks.✓ (10)

4.2

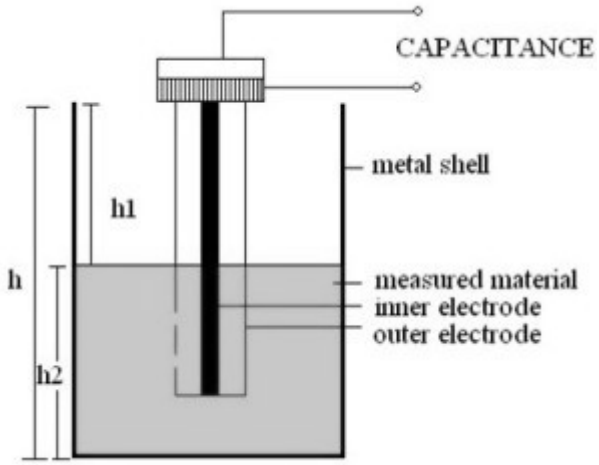


(3 for labelling + 2 for sketch)

It consists of a pully or chain with a float ball on one end and counterweight on the other. The pully or chain drives a sprocket, which turns a pointer.✓ The pointer indicates the level of the tank.✓ The float can be made from a hollow metal ball, but when the tank contains a corrosive liquid, the float should be made of stainless steel.✓ The density of the liquid determines how deep the float will sink into the liquid, thus when designing the system,✓ it must be kept in mind when choosing the correct type of float.✓ (10)

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4.3



(3 for labelling + 2 for sketch) (5)
[25]

TOTAL: 100

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