higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

INSTRUMENT TRADE THEORY N2

1 AUGUST 2018

This marking guideline consists of 7 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	B		
	1.1.2	B		
	1.1.3	B		
	1.1.4	A		
	1.1.5	B		
			(5 × 1)	(5)
1.2	1.2.1	J		
	1.2.2	E		
	1.2.3	D		
	1.2.4	A		
	1.2.5	B		
	1.2.6	M		
	1.2.7	C		
	1.2.8	L		
	1.2.9	G		
	1.2.10	F		
			(10 × 1)	(10)
1.3	1.3.1	True		
	1.3.2	False		
	1.3.3	True		
	1.3.4	True		
	1.3.5	True		
			(5 × 1)	(5)
				[20]

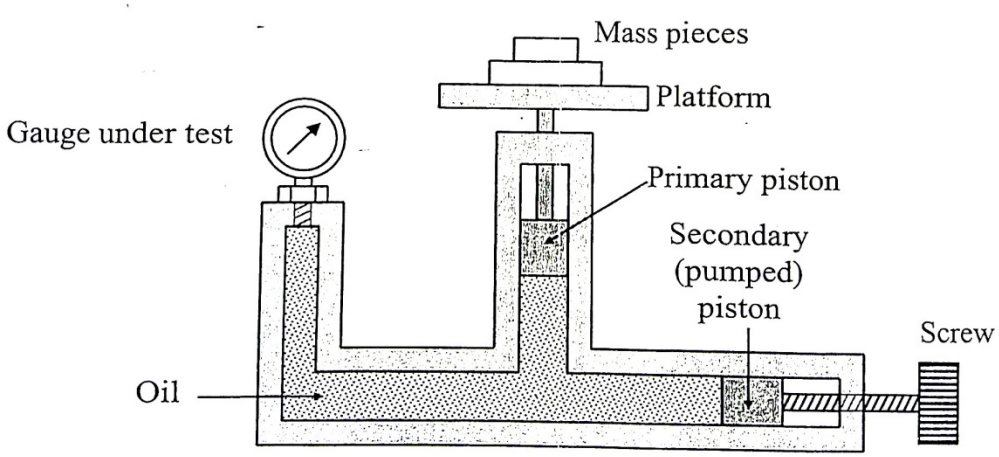
TOTAL SECTION A: 20

SECTION B

QUESTION 2

2.1
- Parallax effect
  The error in reading when the eye is not directly in line with a pointer whose tip is not in the same plane as the instrument scale
- Capillary effect
  When liquid creeps up in a narrow tube and it becomes difficult to read the level (5)

2.2



(ONE mark for each label) (6)

2.3 $$P = \frac{Mg}{A} = \frac{20 \times 10}{0{,}1} = 2\ Kpa$$ (3)

2.4
- Calibrating a manometer-type instrument with air
- Calibrated to a higher differential pressure to compensate for density loss of the sealing liquid (2 + 2) (4)

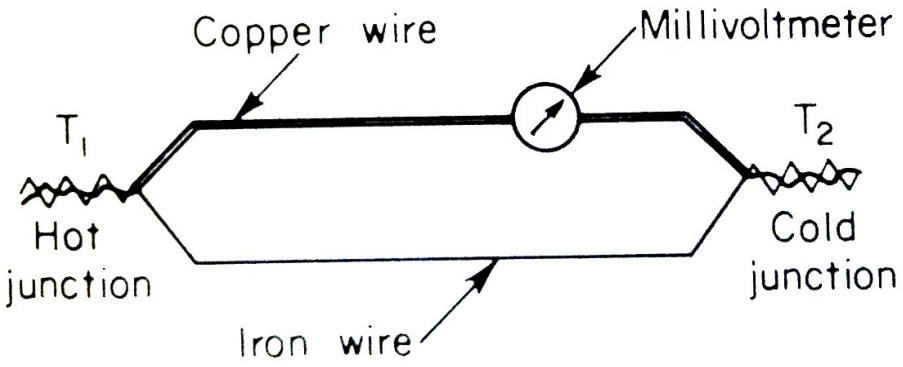
2.5 2.5.1 Differential pressure is the difference between two pressures.

2.5.1 Gauge pressure is the pressure measured with the atmospheric pressure as its reference point.

(2 × 1) (2)
[20]

QUESTION 3

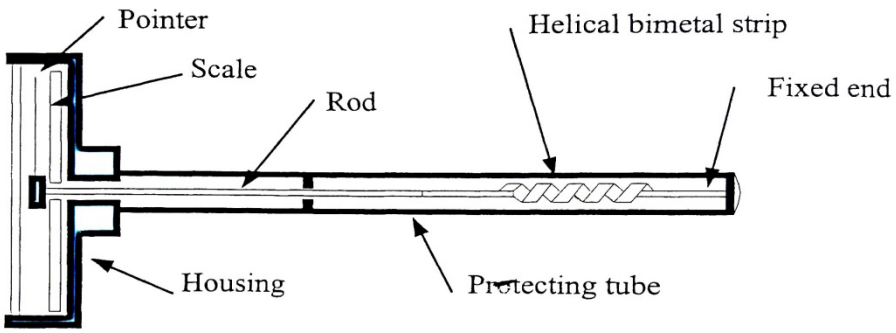
3.1



(ONE mark for each label) (5)

3.2
- Base metal thermocouples
- Noble metal thermocouples (2)

3.3



(ONE mark for each label) (7)

3.4
- Three-lead (wire) method
- Four-lead (wire) method (2)

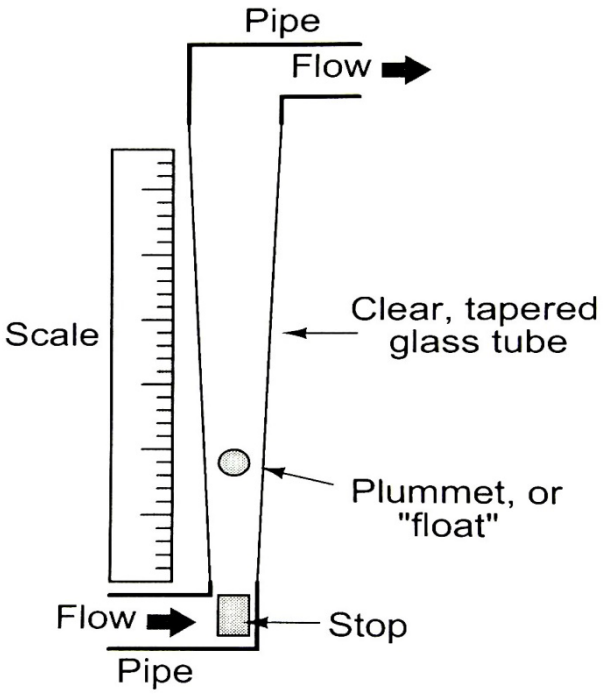
3.5
- Need for standardising voltage before measurements are taken
- Lead-wire resistance is added to the thermometer resistance giving a false temperature reading (4)

[20]

QUESTION 4

4.1 They continuously measure the average velocity of the fluid stream✓ and then the volumetric flow rate is calculated by multiplying this velocity by the cross-sectional area of the pipe.✓✓ (3)

4.2



(ONE mark for each label) (5)

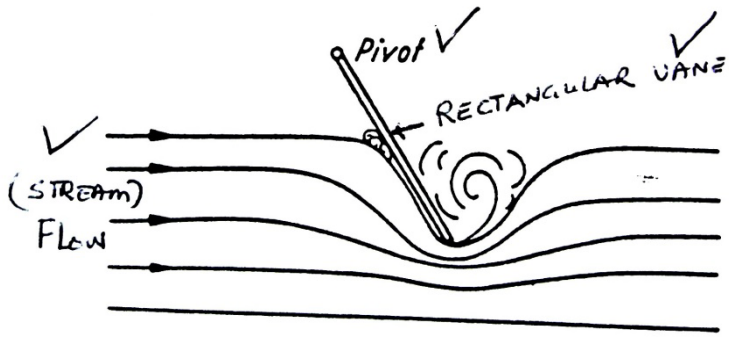
4.3 According to Bernoulli, $Q = k\sqrt{h}$

Thus at maximum flow $k = \frac{Q}{\sqrt{h}} = \frac{500}{\sqrt{16\ 000}} = 126{,}4911$✓

Now if the flow rate is decreased to one half of the maximum, we have $Q = 250l/hr$✓

$h = \left(\frac{Q}{k}\right)^2 = \left(\frac{250}{126{,}4911}\right)^2$ = 4 KPa✓ (3)

4.4



If a rectangular vane is freely pivoted about its upper edge,✓ and allowed to hang in a stream of liquid, it will tend to slow down the liquid stream and to deflect the liquid downwards so that the liquid will flow beneath the vane.✓
The vane will be in equilibrium under the forces acting on it.✓ Since the weight of the vane is constant, the angle through which it is deflected will depend upon the size of the force due to the impinging liquid.✓ The size of this force will depend upon the velocity of the stream.✓ For a liquid of given density, the angle through which the vane is deflected is a measure of the velocity of the stream in which it is placed.✓ (9)

[20]

QUESTION 5

5.1
- Mechanical methods
- Pneumatic techniques
- Electrical methods
- Nucleonic gauges
- Ultrasonic systems (5)

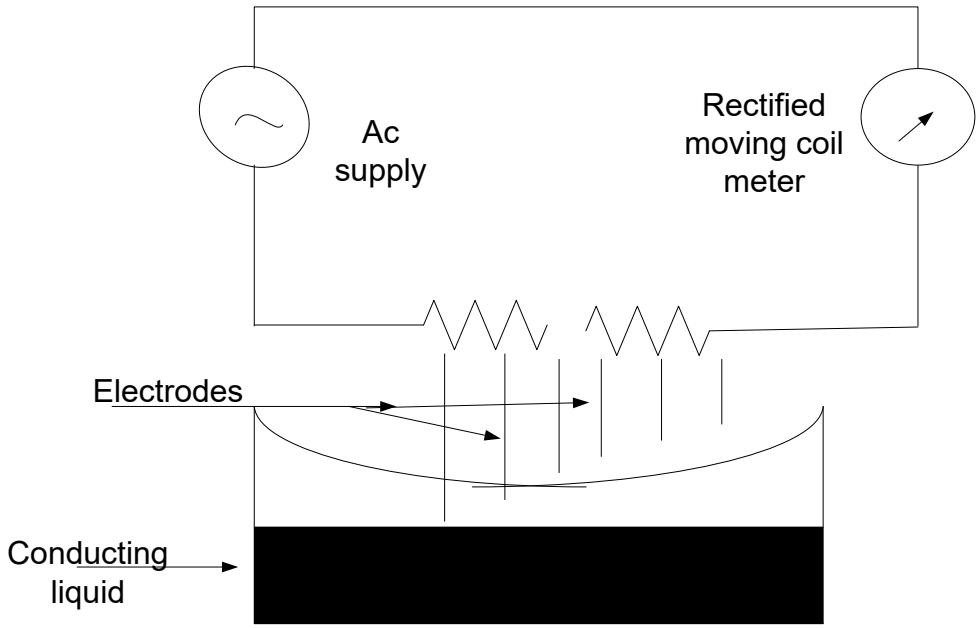
5.2 $\Delta P = \rho g h \backslash$

$h = \frac{\Delta P}{\rho g} = \frac{37\,000}{800 \times 10}$✓✓

$= 4{,}625\ m$✓✓ (4)

5.3
- Pneumatic D/P
- Electronic D/P (2)

5.4



The meter utilises the fact that many industrial liquids conduct electricity.✓ Electrodes of different lengths are suspended from an insulated fixture✓ projected into the liquid under level control. When the level rises or falls,✓ the resistance will either increase or decrease accordingly.✓ This change in resistance is detected by an external circuit and is an indication of the level.✓ (9)
[20]

TOTAL SECTION B: 80
GRAND TOTAL: 100

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