higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T900**(E)**(A8)T

NATIONAL CERTIFICATE

INSTRUMENT TRADE THEORY N2

(11040452)

8 April 2019 (X-Paper)
09:00–12:00

This question paper consists of 4 pages and 1 formula sheet.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
INSTRUMENT TRADE THEORY N2
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Take g = 10 m/s².
5. Write neatly and legibly.

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QUESTION 1

1.1 Make a neat, labelled sketch of an unequal-leg U-tube manometer. (5)

1.2 Define each of the following terms:

1.2.1 Pressure (1)

1.2.2 Viscosity (1)

1.2.3 Wet calibration (1)

1.2.4 Ice point (1)

1.2.5 Absolute pressure (1)

1.2.6 Discharge coefficient (1)

1.2.7 Static pressure (4)

1.3 Calculate the height between the sealing liquid levels in a U-tube manometer if the differential pressure is 80 kPa and the manometer is filled with mercury. (5)

[20]

QUESTION 2

2.1 Make a neat, labelled sketch of a ring balance meter and describe its operation. (10)

2.2 Give FIVE precautions to observe when using the dead-weight tester. (5)

2.3 Give THREE advantages and TWO disadvantages of the pirani gauge. (3 + 2) (5)

[20]

QUESTION 3

3.1 Sketch a liquid expansion thermometer and describe its operation. (10)

3.2 Sketch a self-balancing resistance thermometer and describe its operation. (10)

[20]

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QUESTION 4

4.1 Describe, with the aid of a sketch, the operation of a rotameter area flow meter. (15)

4.2 Give THREE advantages and TWO disadvantages of a rotameter/area flow meter. (3 + 2) (5)

[20]

QUESTION 5

Make a labelled sketch of an oscillating piston flow meter and describe its operation. **[10]**

QUESTION 6

Describe, with the aid of a sketch, the operation of a sight-glass levelling instrument. **[10]**

TOTAL: 100

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FORMULA SHEET

$P_G = Pabs - Pa$

$P_1 - P_2 = h\Delta g$

$P_1 - P_2 = d\rho g\left(\frac{A_1}{A_2}+1\right)$ OR $P_1 - P_2 = d\rho g\left(\frac{A_2}{A_1}+1\right)$

$$p = \frac{Mg}{A}$$

$$\frac{Q_1}{Q_2} = \frac{k\sqrt{h_1}}{k\sqrt{h_2}}$$

$$\text{Dry calibration} = \frac{P_1 - P_2}{\rho g}$$

$$\text{Wet calibration} = \frac{P_1 - P_2}{(\rho_2 - \rho_1)g}$$

$$\text{W.C.} = \left(\frac{\rho_2}{\rho_2 - \rho_1}\right) \times \text{D.C.}$$

$$\text{D.C.} = \left(\frac{\rho_2 - \rho_1}{\rho_2}\right) \times \text{W.C.}$$

$$H = \frac{\Delta P}{\rho g}$$

$$H = h\left(\frac{\rho_2}{\rho_1} - \frac{1}{2}\right)$$

$$H = \frac{\rho_2}{\rho_1}h - \frac{h}{2} - H = \left(\frac{P2}{P1} - \frac{1}{2}\right)h - H_1$$

$$t°C = \frac{9}{5}t + 32\ ^\circ\text{F}$$

$$t°C = (t + 273{,}15)\ \text{kelvin}$$

$$t°F = \frac{5}{9}(t - 32)\ ^\circ\text{C}$$

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