higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T820**(E)**(A12)T

NATIONAL CERTIFICATE

INDUSTRIAL INSTRUMENTS N5

(8080205)

12 April 2019 (X-Paper)
09:00–12:00

This question paper consists of 5 pages.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
INDUSTRIAL INSTRUMENTS N5
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. Write neatly and legibly.

SECTION A: (FLOW MEASUREMENTS)

QUESTION 1

1.1 Below is a description of the operation of a Pitot tube.

Complete the following sentences by using the words in the list below. Write only the word(s) next to the question number (1.1.1–1.1.11) in the ANSWER BOOK.

velocity; impact pressure; greater; obstruction; impinges; difference; impact pressure; tapping; decrease; static pressure; pressure energy

As fluid approaches an (1.1.1 …) in a flow stream, the (1.1.2 …) will (1.1.3 …) until it reaches zero at a point it (1.1.4 ...) on it .The kinetic energy is now converted to (1.1.5 …) Thus, the pressure built up is (1.1.6 …) than that in the free stream because of (1.1.7 …) The difference is measured between the pressure in the tube and the (1.1.8 …) of the stream. The static pressure is measured by a (1.1.9 …) in the wall of the main. The (1.1.10 ...) between the pressure in the tube and the static pressure will be measured by (1.1.11 …), and therefore by the velocity of the stream. (11)

1.2 Explain the purpose of primary flow element. (4)

1.3 Name FIVE main orifice tapping positions and explain them. (5 × 2) (10)

1.4 Name FIVE examples of differential pressure type flow rate-measuring devices. (5)

[30]

QUESTION 2

Prove with the aid of the energies and the application of Bernoulli's theorem for liquids, that $Q = C.A_2.E\sqrt{2gh}$ for an orifice plate. **[15]**

SECTION B: (DENSITY, HUMIDITY AND VISCOSITY MEASUREMENT)

QUESTION 3

3.1 The adsorption of gamma radiation is a function of the mass of the material situated between the gamma-ray emitting sources of the detector.

Draw a neat labeled sketch of density measurement using gamma rays. (6)

3.2 Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–F) next to the question number (3.2.1–3.2.6) in the ANSWER BOOK.

COLUMN A		COLUMN B	
3.2.1	A solution which has reached the limit of solubility	A	hygrometer
3.2.2	The temperature of a fluid when condensation takes place	B	absorption
3.2.3	The adhesion of a fluid in extremely thin layers to the surface of a solid	C	saturation pressure
3.2.4	The taking in of fluid to fill the gaps in solids	D	saturated solution
3.2.5	The pressure of a fluid when condensation takes place at a given temperature	E	adsorption
3.2.6	An apparatus that measure humidity	F	saturated temperature

(6 × 1) (6)

3.3 State FIVE points to be observed when using a falling piston viscometer. (5)

3.4 Name SIX undesirable things to watch out for when using the coaxial-cylinder viscometer. (6)

[23]

SECTION C: (pH MEASUREMENT)

QUESTION 4

Make a neat labeled sketch of a pH measuring circuit. **[12]**

SECTION D: (AUTOMATIC CONTROL)

QUESTION 5

5.1 Make a neat labeled sketch of an on-off pneumatic controller. (8)

5.2 Name THREE types of relays and explain them. (3 × 2) (6)

5.3 Make sketches to show the effects of narrowing proportional band on the recovery curves following set-point load changes. (6)
[20]

TOTAL: 100