

PROGRAM	NATIONAL DIPLOMA ENGINEERING: ELECTRICAL
SUBJECT:	Process Automation 3 A – Supp
CODE:	PCAELA3
DATE:	July 2019 – Supplementary Exam
DURATION:	3 hours
WEIGHT:	40:60
TOTAL MARKS:	100
ASSESSOR:	Mr. V Rameshar
MODERATOR:	Mrs. J Buisson-Street
NUMBER OF PAGES:	4 Pages
INSTRUCTIONS:	NON-PROGRAMMABLE POCKET CALCULATOR MAY BE USED.
	All SKETCHES MUST BE NEAT AND LABELLED.
	PLEASE WRITE CLEARLY.
	PLEASE ANSWER ALL QUESTIONS

QUESTION 1

- 1.1 Name and describe the three (3) types of level measurement systems. (6)
- 1.2 With the aid of a sketch describe RANGE and SPAN. Provide suitable equations to substantiate your answer. (6)
- 1.3 What is the final speed of a standstill H_2O molecule when bombarded by an alpha particle starting at the speed of sound? Use the equation below. (3)

$$V_3 = \frac{-V_1(m_2 - m_1)}{m_1 + m_2}$$

[15]

QUESTION 2

- 2.1 Sketch and describe a Vortex flow meter. Provide appropriate labels for your sketch. (6)
- 2.3 What is the volumetric flow for a solid of 100 m³ and a forward transit time of 20 ms and reverse transit time of 10 ms? (4)

$$Q = k \frac{t_1 - t_2}{t_1 t_2}$$

2.4List one (1) advantage and one (1) disadvantage of a Doppler flow meter.(2)[12]

QUESTION 3

3.1 List five (5) applications of instruments within the process automation environment. (5) 3.2 List five (5) types of flow metres excluding the one mentioned in question 2.1. (5) 3.3 What will the material relative density be of a system with 30 kPa pressure and a tank level of 2 metres? (3) $P = \rho$.g.h [13]

QUESTION 4

4.1	State six advantages of a Target Flow Meter. (6		
4.2	List the three (3) advantages and disadvantages of an electromechanical plumb level measurement systems.	bob (6)	
		12]	
<u>QUE</u>	<u>ESTION 5</u>		
5.1	In process automation, three (3) basic valves have been studied. List these valves.	(3)	
5.2	Describe, briefly, whathappens at the valve inlet, when the valve is fully opened, at the valve outlet.	and (6)	

	(0)
Discuss two (2) reasons as to why pressure drops at the inlet of the valve.	(4)
With respect to control valve sizing, what measures have to be considered?	(6) [19]
	Discuss two (2) reasons as to why pressure drops at the inlet of the valve. With respect to control valve sizing, what measures have to be considered?

QUESTION 6

6.1	What will 273 Kelvin be in degrees Fahrenheit?	(2)
6.2	Sketch a Constant Current RTD sensing circuit.	(5)
6.3	Sketch a Bi-Metal Thermometre and provide a brief operation.	(7)
6.4	Explain the operating principle of a Steel Mercury Thermometer.	(5) [19]

QUESTION 7

7.1	List any three (3) sensors and state what they measure in a process	automation system. (6)
7.2	Sketch a basic process block diagram with respect to transducers.	(4) [10]
		Total Marks = 100