



UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET

COURSE CODE	: DEI 3003
COURSE TITLE	: PROCESS INSTRUMENTATION
SEMESTER/SESSION	: 1-2023/2024
DURATION	: 3 HOURS

Instructions:

- a) This booklet contains 4 questions. Answer **ALL** questions.
- b) All answers should be written in answer booklet.
- c) Write legibly and draw sketches wherever required.
- d) If in doubt, raise up your hands and ask the invigilator.

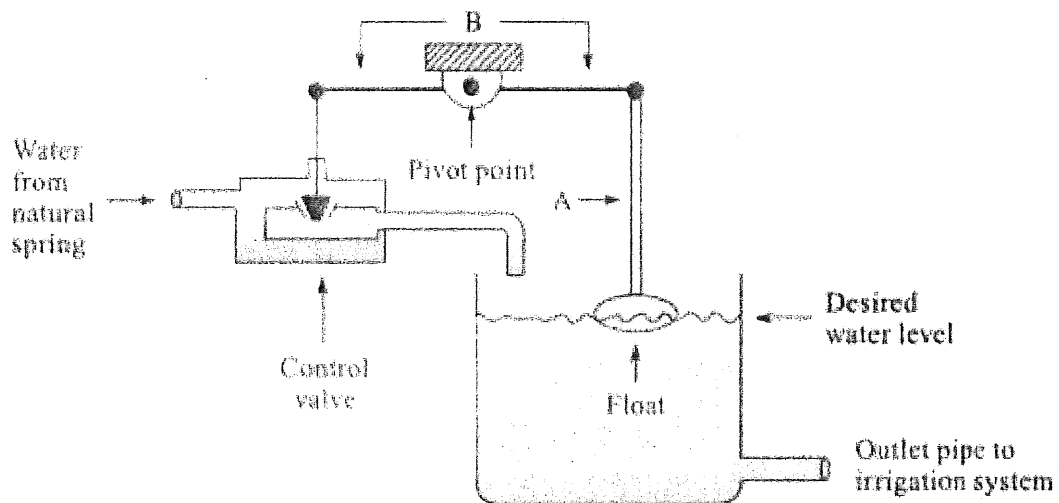
DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 7 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

- a) Define each term.
- i. Control system (2 marks)
 - ii. Process (1 mark)
 - iii. Instrumentation (1 mark)
- b) Figure 1 shows the process of irrigation system. Briefly describe the process to maintain the water at desired level. (Controlled Variable, measurement variable, measurement device and actuator)

(10 marks)

**Figure 1**

- c) An automated temperature control system is illustrated in Figure 2. It shows a process to produce hot water. Produce the P&ID for the system with complete tagging.

(10 marks)

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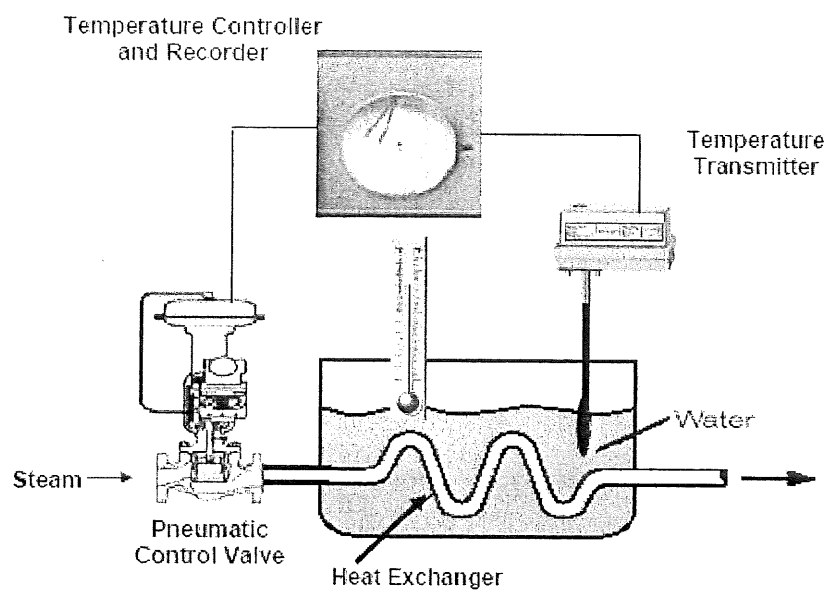


Figure 2

QUESTION 2

- a) List two (2) electrical temperature measurement instruments. (2 marks)
- b) State four (4) types of pressure. (4 marks)
- c) List four (4) mechanical measurement instruments for pressure. (4 marks)
- d) The Bourdon tube is one of the measuring instruments for pressure. Give three (3) types of bourdon tubes. (3 marks)
- e) Describe the advantages and disadvantages of differential pressure flow meter. (8 marks)
- f) A temperature transmitter, TT123 with range 0 – 50 degC is used to measure temperature in the tank. Find the output current (mA) produced if the transmitter reads at 25 degC. (Output range 4 – 20 mA). (6 marks)
- g) Figure 3 shows a closed tank with dry leg. Calculate the lower range value (LRV) and upper range value (URV) for DP transmitter. (10 marks)

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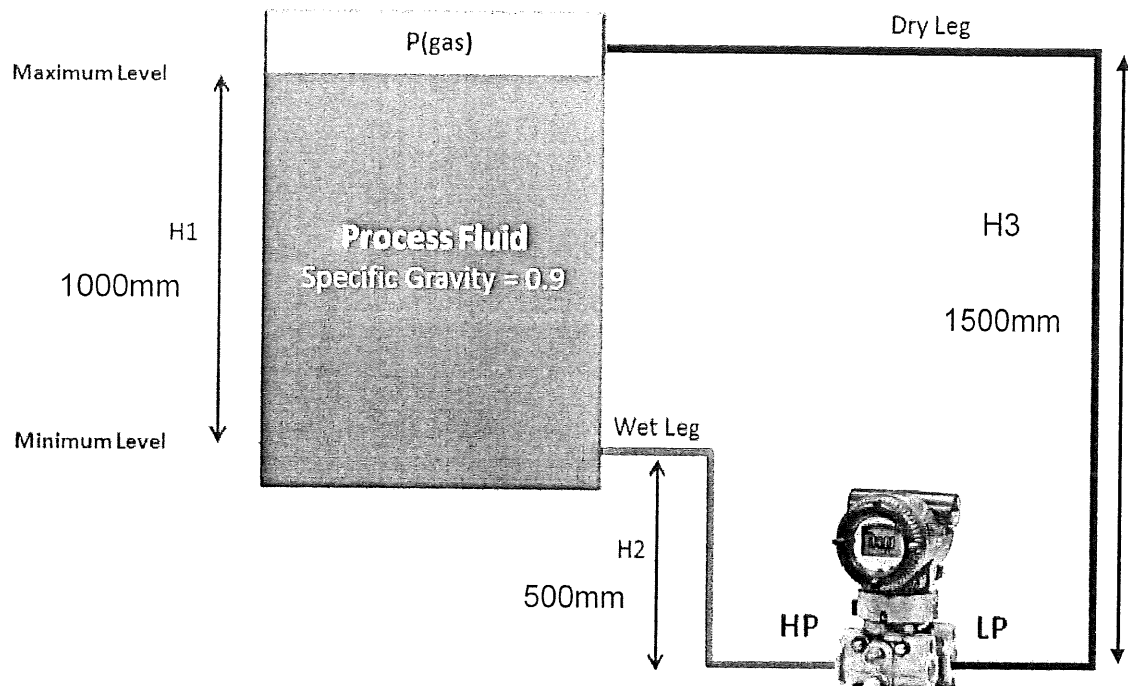


Figure 3

QUESTION 3

- a) State two (2) types of signal transmission. (2 marks)
- b) List four (4) advantages of digital system. (4 marks)
- c) Table 1 shows a 0-100% output signal that relates to common dimensional output values. Find the value for the output. (5 marks)

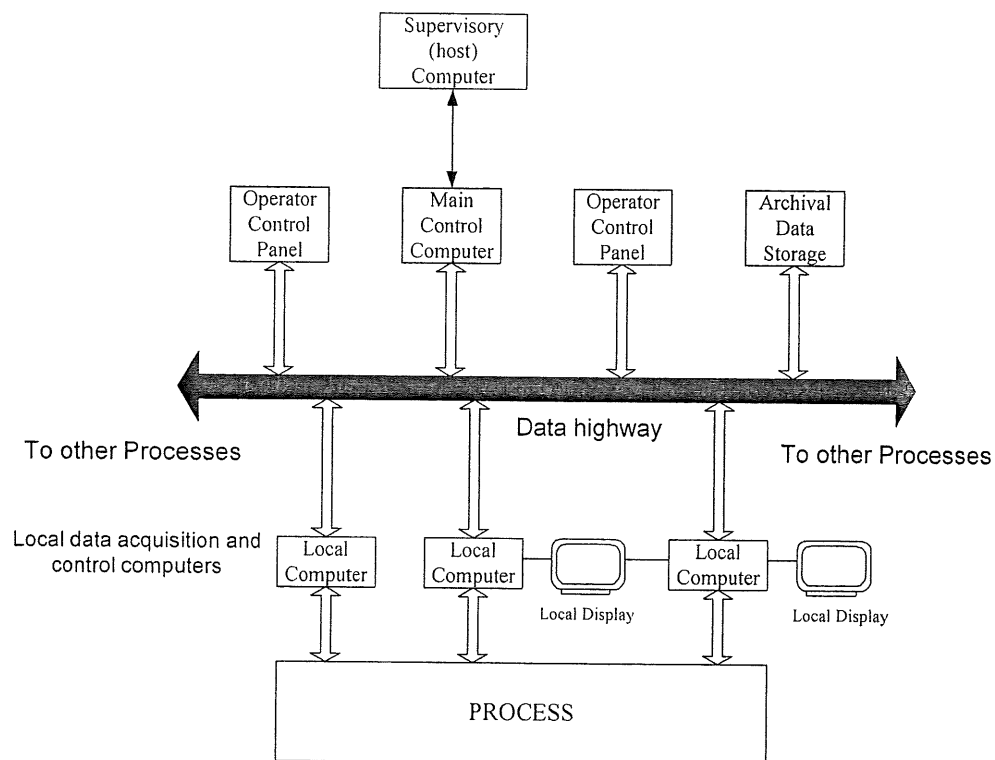
Table 1

Output Unit, %	Output Value 4-20 mA	Output Value 2-10 bar
0%	4 mA	iii.
25%	i.	4 bar
50%	12 mA	iv.
75%	ii.	v.
100%	20 mA	10 bar

- d) A pressure transmitter PT101 with range 10 – 80 psi is used to measure pressure in the tank. Calculate the output current (mA) produced if the transmitter reading at 70 psi.
(Output range 4 - 20mA) (5 marks)

QUESTION 4

- a) State three step in Programmable Logic Controller operation. (3 marks)
- b) State three (3) advantages of Distribute Control System (DCS). (3 marks)
- c) Describe the function of each PLC modules. (8 marks)
- d) Figure 5 shows a DCS in a process control. Describe nine elements in the DCS system. (9 marks)

**Figure 5**

-----End of question-----

