

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/  
MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2024**

**PROCESS CONTROL INSTRUMENTATION**

[Maximum Marks: 75]

[Time: 3 Hours]

**PART-A**

**I. Answer ‘all’ the following questions in one word or one sentence. Each question carries ‘one’ mark.**

**(9 x 1 = 9 Marks)**

		<small>Module Outcome</small>	<small>Cognitive level</small>
1.	Define process.	M1.01	R
2.	The error detector compares between.....signal and..... signal.	M1.02	R
3.	Process load refers to this set of all parameters, excluding the.....	M1.03	R
4.	Multiposition control mode is the logical extension of.....control mode to provide several intermediate settings of the controller output.	M2.02	U
5.	Two-position controllers are purposely designed with.....to prevent excessive cycling.	M2.02	U
6.	Name the valve, in which the stem and plug moves down and restricts the fluid flow when air pressure increases.	M3.03	U
7.	Define control valve coefficient Cv.	M3.03	R
8.	HART enables a.....way field communication.	M4.04	R
9.	List any two functions of alarm.	M4.01	R

**PART-B**

**II. Answer any ‘eight’ questions from the following. Each question carries ‘three’ marks.**

**(8 x 3 = 24 Marks)**

		<small>Module Outcome</small>	<small>Cognitive level</small>
1.	List any three process parameters of a process control system.	M1.03	R
2.	Describe automatic process control with suitable example.	M1.02	U
3.	Compare batch process and continuous process.	M2.01	U
4.	In an application of the Ziegler-Nichols method, a process begins oscillation with a 30% proportional band in an 11.5-min period. Find the nominal three-mode controller settings.	M2.04	A
5.	List the advantages, disadvantages and applications of proportional derivative control mode.	M2.03	R
6.	Draw the block diagram of final control operation.	M3.01	R
7.	Draw the characteristics curves of control valve.	M3.03	R
8.	Explain the operating principle of pneumatic actuator with figure.	M3.02	U
9.	Design an alarm circuit using logic gates for a closed tank containing liquid, an alarm will trigger when both liquid level and pressure are high.	M4.01	A
10.	Name any three layers of HART.	M4.04	R

**PART-C**

Answer 'all' questions from the following. Each question carries 'seven' marks.

**(6 x 7 = 42 Marks)**

		Module Outcome	Cognitive level
III.	Explain elements of process control loop with block diagram. <b>OR</b>	M1.01	U
IV.	Explain temperature process control with an example.	M1.04	U
V.	Explain proportional control mode. <b>OR</b>	M2.03	U
VI.	Explain electronic error detector using an op-amp.	M2.03	U
VII.	Describe about single seated valve and double seated valve. <b>OR</b>	M3.03	U
VIII.	Describe the current to pressure convertor with neat figure.	M3.04	U
IX.	Explain the block diagram of General Telemetry system. <b>OR</b>	M4.02	U
X.	Explain the Profibus DP.	M4.03	U
XI.	Describe any three control system parameters. <b>OR</b>	M1.03	U
XII.	Describe pressure process control system with an example.	M1.04	U
XIII.	A holding tank for which liquid level, inflow FA, and inflow FB are monitored. These measurements are converted to voltages and then, with comparators, to digital signals that are HIGH when some limit is exceeded. The flow variables FA and FB will be 0 for low flow and 1 for high flow. The level variables are such that L2 is 1 if the level exceeds the lower limit and L1 will be 1 if the level exceeds the upper limit. The alarm will be triggered if either of the following conditions occurs: 1. L2 LOW and neither FA nor FB HIGH 2. L1 HIGH and FA or FB or both HIGH Design an alarm circuit for this problem with digital logic gates. <b>OR</b>	M4.01	A
XIV.	In a process industry the fire & safety department installed flame sensor, smoke sensor, and temperature sensors. These sensors monitor and detect spread of flame, dense smoke, and threat of high temperature respectively. An alarm will be triggered when two or more sensors detect abnormal condition (i.e. the output of sensors are high). Design an alarm circuit using logic gates for the above situation.	M4.01	A

\*\*\*\*\*