Total number of printed pages – 3

B. Tech.
CPEN 5401

Eighth Semester Examination – 2011

PROCESS CONTROL INSTRUMENTATION

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

(a) Draw the block diagram of a Process Control Loop showing the basic elements and signals involved.

(b) Distinguish between "Controlled variable" and "Controlling variable".

(c) What are the characteristics of a derivative controller ?

(d) Find error for a set-point of 10.5 mA and measured value of 13.7 mA within the signal range of 4-20 mA.

(e) Explain the term "Process Load".

(f) Define proportional band. How is it related to the proportional gain between error and controller output ?

(g) What is the architecture of a smart sensor ?

(h) Draw a circuit diagram to implement ON/OFF controller.

(i) What is the importance of neutral zone on the performance of ON/OFF controller?

(j) Suggest suitable controller for a system having small process lag and large load change.

P.T.O.

Translator: Pierre Giorgi Instruments in many research laboratories can be used to detect and measure physical quantities, to perform calculations, and to measure the output of other instruments and systems. The widespread application of such devices is driven by the need to make measurements that previously could only be made by using destructive techniques. Although these measurement techniques have become ubiquitous in physics and chemistry, the ease with which the output of a device can be recorded and the ease with which the result of an experiment can be quantified make them useful for a wide range of industrial applications. One application is in the optimization of industrial processes. Process optimization often requires the use of multiple instruments, and it is often easier to make measurements using a combination of instruments than to make such measurements using a single device. In some cases, such a combination of devices can provide new techniques, or at least new approaches, for measuring a property of a sample. Moreover, it is often easier to use a combination of measurement techniques and data analysis than to make measurements using a single technique. This Guidebook is a practical introduction to the use of instruments and measurements. It is intended to help readers gain the practical skills needed to make measurements using instruments, to collect data using instruments, and to use the data that are gathered to make inferences about a physical system. The Guidebook does not aim to be an exhaustive discussion of the principles of measurement and instrumentation; it is rather a detailed account of the principles and practical aspects of electrical instrumentation, which are discussed in Chapters 1 to 4. Such a book would be out of place in this series. Readers who have a background in electrical measurement or those interested in electrical instrumentation may find this Guidebook useful for developing practical skills that may be applied to research and design projects. 1 Introduction ========== 1.1 Use of electrical instruments in measurements ---------- Instrumentation is used to make measurements that are used in the control and optimization of industrial processes. The design of these instruments varies, depending on their application and the type of equipment required, but may include such items as voltage, current, pressure, temperature, humidity, light intensity, and mechanical force. Because they are used to measure physical quantities, instruments are often referred to as measuring instruments. In many cases, an instrument consists of a measurement device, a collection device for the output from the measurement device, and a control device to interact with the collection device and the measurement device. Most instruments are designed with the output 82157476af