V Summary and conclusion

CHAPTER V

"Summary and Conclusion"

Since 1971 microprocessors improvements in regard to the bits processing capacity. Addressing capacity, memory expansion and speed of execution have met with tremendous success, and scientific and technological applications. An important concept which distinguishes the microprocessors from other machines is the programmibility. An element of versatality is added to its multifaceted complexion by its capacity to take decisions and diverts itself from the routine execution of the main porgram. Microprocessor has found applications which are legion in the process control, instrumentation and measurements. Since temperature is a very important parameter in many industrial processes and laboratory experimentation, its measurement and control with more and more sophistication are comming up and expected to come up very fast. It is therefore thought worthwhile to build a system of temperature control and measurement around a microprocessor.

The entire work is divided in to four chapters. The 1st chapter deals with the historical development of LSI and the evolution of the microprocessors from 1971 onwards with the general architecture of microprocessor also discussed.

The advantages of the microprocessor based system also feature in the chapter and it is concluded with the orientation of the work.

In chapter - 2 : The survey of different transducer used for the measurement of temperature is taken. The theoretical details of the actual transducer, the semi-conductor P-n Junction silicon diode are given Experimental set-up is described to determine the temperature coefficient of the forward voltage of the diode. It is observed that from the range of temperature from 0 to 100^{o}C there is a perfect linearity exhibited by the temperature variation of the diode forward voltage. The temperature coefficient estimated to be - 2 mv/^{o}C.

500 watts coiled coil of heater is used to heat the furnace which is made up of copper. The inner copper pot is of diameter 4" and height 6", 5 turns of this coiled coil are wound around it. The outer pot is 8" in diameter and 10" in height and surrounds the inner copper pot. The glass wool provides the insulation. References are given at the end of the chapter.

In the 3rd chapter, architecture of 8085 microprocessor is discussed. The function of all the pins are given and the appropriate figures are drawn. The microprocessor 8085 is compared with its other 8-bit μ-processors, zilog Z-80 Motorola 6800 and MOS technology 6502.

We have used 8085 MP because of the

i) Easy availability of the peripherals.
ii) Enough literature available on 8085 and its peripherals.
iii) Acceptability of 8085 as industrial standard. Some techniques of temperature measurement and control using 555 timer in the astable mode are discussed.

The general block diagram of the microprocessor based control system is shown. The advantages of microprocessor based system are,

i) Commissioning, modification and replacement are made easier.
ii) Its memory and arithmetic capacity offer greater sophistication then discrete logic.
iii) It can be reprogrammed for the variety of task.
iv) It is less expensive than dedicated analog devices and
v) It can be used where size, weight and power consumption are severve constraints.

A temperature control system around MPU using thermocouple as a sensor is discussed. One more ON-OFF control for temperature is given for the microprocessor 8080 with its software.

In chapter- 4 general features of the process control are explained. The different control modes are two position mode, multiposition mode, floating control mode, proportional control mode, Integral control mode, proportional integral

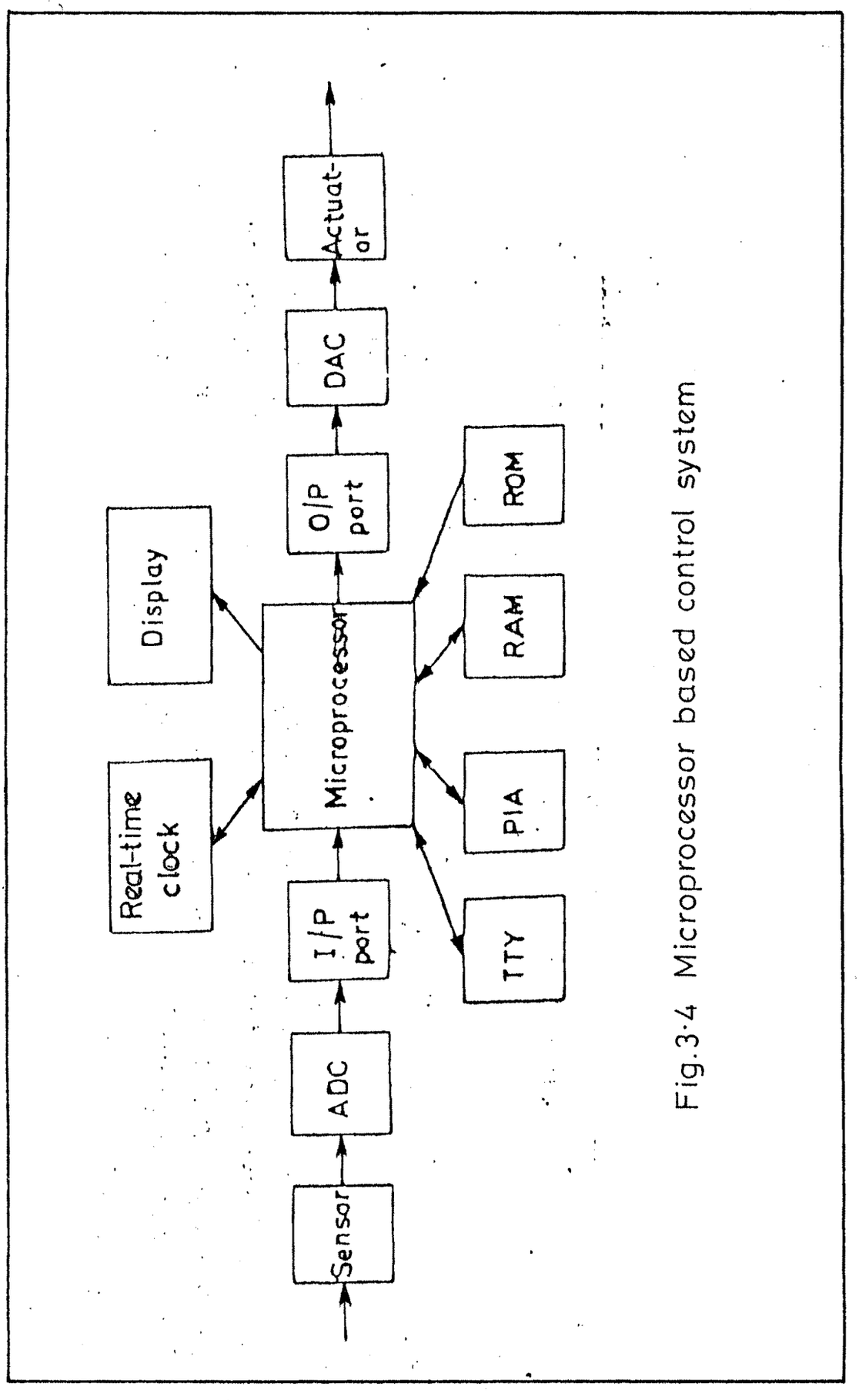

Fig.3·4 Microprocessor based control system

mode, proportional derivative mode, proportional integral derivative mode etc. These modes are explained in detail and the mathmatical expression for the control mode are also given.

The later part of this chapter deals with the description of temperature control system. The output of the sensor which is immersed in the liquid whose temperature is to be controlled is amplified by operational amplifier LM 308, The offset of this amplifier at $0^{o}C$ and $100^{o}C$ is balanced by the pot meters. The analog equivalent voltage of the temperature is digitised by A to D converter. The digital output is displaced and also processed by the microprocessor 8085 based system. For this 8155 is used as I/O and input to the microprocessor comes from port A. By software BCD output is converted in to Binary, the setpoint corresponding to the temperature $61^{o}C$ is stored in the EPROM 2732. This set point is compared with the sensor output and the error signal is calculated. The errorsingal is processed by PI software and is used to control the ON time of the heater control circuit. If the error is large the ON time is also large and vice-versa.

The address decoding method is given. 74139 is used to select one of the three chips 2732, 8155 (A) and 8155 (B). The ALE signal issued by the microprocessor latches the

addresses in 8155 and 8212. The flow chart for, the main temperature control program. ZVS, A to D conversion packed BCD program and control program are drawn. This chapter is concluded with the details of the support chips 2732, 8155 and 8212.