

Certification Course
On
PLC and Its Applications

Co ordinator: Sri.T.Kishore Kumar

Date(s) of Event : 01/09/2020-19/09/2020

Organizing department:

Electrical and Electronics Engineering



K.S.R.M.COLLEGE OF ENGINEERING

(UGC-AUTONOMOUS)

Kadapa, Andhra Pradesh, India-516 005

Approved by AICTE, New Delhi & Affiliated to JNTUA,

Cr./KSRMCE/(Department of EEE)/2020-2021

Date: 25/08/2020

To

The Principal,

KSRM College of Engineering,

Kadapa.

Respected Sir

Sub: KSRMCE-(Department of EEE) permission to conduct certification course on "PLC and Its Applications"-Request-Regd.

It is brought to your kind notice that, with reference to the cited, the EEE department is planning to conduct Certification Course on "PLC and Its Applications" for B.Tech, VII Sem Students from 01/09/2020-19/09/2020. In this regard I kindly request you to grant permission to conduct the certification course. This is submitted for your kind perusal.

Thanking you sir,



Yours Faithfully

T.Kishore Kumar

Asst.Prof,Dept.EEE

KSRMCE,Kadapa.

Permitted
V. S. S. Muly
PRINCIPAL
K.S.R.M. COLLEGE OF ENGINEERING
KADAPA - 516 003. (A.P.)

To the Director for Information

To All Deans/HoD's/IQAC



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Kadapa, Andhra Pradesh, India-516 005

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Cr./KSRMCE/(Department of EEE)/2020-2021

Date: 26/08/2020

Circular

All the B.Tech VII Sem EEE students are here by informed that department of EEE is going to conduct certificate course on "PLC and Its Applications" interested students may register their names on or before 30 August ,2020 before 5 Pm.

For any queries contact faculty coordinator :

Sri .T.Kishore Kumar,Asst.Prof,Dept.EEE, KSRMCE, Kadapa.


HEAD OF THE DEPARTMENT

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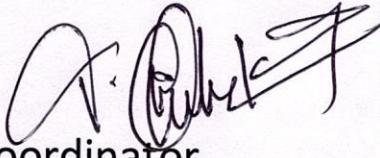
Department of Electrical and Electronics Engineering
Certification Course on MATLAB Programming

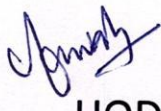
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Syllabus

Sl. No.	Topic	Hours
		Theory
Module 1	Definition & History of PLC, Basic structure & Components of PLC, Principle of Operation, Selection of PLC, Why Use PLC, PLC I/O Modules, Memory & How it is used, PLC advantages & Disadvantages, PLC vs Computers, , Overview of Micro PLCs.	08
Module 2	Conventional ladders vs PLC Ladder logic, What is Logic? Overview of Logic functions, Number systems & Codes, Hardwired Logic vs Programmed logic,	08
Module 3	Processor memory organization, PLC Programming languages, Ladder diagrams, Relays, contactors, switches, sensors, output control devices, latching relays, ladder diagram elements.	08
Module 4	Basic Functions : PLC Timer & Counter functions, Timer & Counter Industrial applications, Arithmetic functions, Comparison functions, Jump functions, Data handling functions, Digital Bit functions, PLC matrix Functions, Advanced PLC Functions: Analog PLC operation, PID control of Continuous processes.	10

TEXT BOOKS

- 1.Introduction to PLCs, Second Edition Jay F. Hooper
- 2.PLC Programming Using RSLogix 5000: Understanding Ladder Logic and the Studio 5000 Platform Clark, Nathan
- 3.Programmable Logic Controller (PLC) Tutorial, Siemens Simatic S7-1200 Tubbs, **Stephen Philip (Author)**

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Department of Electrical and Electronics Engineering


Certification Course on "PLC and Its Applications"

Schedule

Timing: 4:00pm – 6:00pm

S.No	Date	Course Coordinator	Topic Coverd
1	01/09/2020	Sri K.Kalyan Kumar	Definition & History of PLC, Basic structure & Components of PLC.
2	02/09/2020	Sri K.Kalyan Kumar	Principle of Operation, Selection of PLC
3	03/09/2020	Sri K.Kalyan Kumar	Why Use PLC, PLC I/O Modules, Memory & How it is used
4	04/09/2020	Sri K.Kalyan Kumar	PLC advantages & Disadvantages, PLC vs Computers, Overview of Micro PLCs
5	05/09/2020	Sri K.Kalyan Kumar	Conventional ladders vs PLC Ladder logic,
6	07/09/2020	Sri K.Kalyan Kumar	What is Logic? Overview of Logic functions,
7	08/09/2020	Sri K.Kalyan Kumar	Number systems & Codes
8	09/09/2020	Sri K.Kalyan Kumar	, Hardwired Logic vs Programmed logic,
9	10/09/2020	Sri K.Kalyan Kumar	Processor memory organization, PLC Programming languages,
10	11/09/2020	Sri K.Kalyan Kumar	Ladder diagrams
11	12/09/2020	Sri K.Kalyan Kumar	Relays, contactors, switches, sensors,.
12	14/09/2020	Sri K.Kalyan Kumar	output control devices, latching relays, ladder diagram elements
13	15/09/2020	Sri K.Kalyan Kumar	Basic Functions : PLC Timer & Counter functions,
14	16/09/2020	Sri K.Kalyan Kumar	Timer & Counter Industrial applications
15	17/09/2020	Sri K.Kalyan Kumar	Arithmetic functions, Comparison functions, Jump functions, Data handling functions,.
16	18/09/2020	Sri K.Kalyan Kumar	Digital Bit functions, PLC matrix Functions, Advanced PLC Functions
17	19/09/2020	Sri K.Kalyan Kumar	Analog PLC operation, PID control of Continuous processes


Coordinator


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Department of Electrical and Electronics Engineering
Activity Report

Name of the Event : Certification Course on PLC and Its Applications
Date of the Event : 01/09/2020-19/09/2020
Scheduled Time : 4.00 to 6.00PM
Target Audience : B.Tech VII Sem Students
Student Co-ordinator : K. SOMANJU
Venue of the Event : online(<https://meet.google.com/lookup/dkej4ijy4>)

Activity Description:

Department of EEE organized a certification course on PLC and Its Applications for the VII sem Students in online mode. Sri K.Klayan Kumar ,Asst.Prof EEE department has given Excellent presentation on PLC and its applications. Sir explained about the fundamentals of Programmable Logic Controller (PLC) operations, including symbology and programming techniques. PLC hardware and data structures will be presented. Methods of using the programming interface to troubleshoot applications will be emphasized. The student will write, enter, and execute application programs using the programmable controllers and Human Machine Interface (HMI).

Coordinator

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Principal

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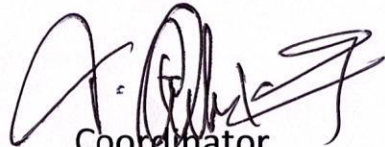
Certificate Course on


PLC and Its Applications
01/09/2020-19/09/2020

Organized by

DEPARTMENT OF
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78	THOTA PAVANKUMAR REDDY	189Y5A0256	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓
79	VADDE ABHISHEK	189Y5A0257	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓
80	VALLEPU SANDEEP	189Y5A0258	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓
81	VANGIMALLA MAHESWAR REDDY	189Y5A0259	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓
82	VENNAPUSA CHARAN KUMAR REDDY	189Y5A0260	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓
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PLC and Its Applications

TERMINOLOGIES

1. Control System
2. Reference Input
3. Controlled Variable
4. Disturbance
5. Feedback Element

1. Control System is..

Components that connected to system or process that want to be controlled.

□ 5 basic element of control system:

- i. Reference signal generator
- ii. Measurement element
- iii. Comparator
- iv. Controller
- v. Actuator

2. REFERENCE INPUT:

- Is a signal to start a system.
- Ex: such as temperature, pressure and level.
- Fix value.

3. CONTROLLED VARIABLE:

- Is a signal or variable that is controlled at its output.
- Ex: Temperature, pressure and level.
- Fix value.

4. DISTURBANCE:

- Element that disturb a control signal in control system.
- Can be from within the system itself or external.

5. FEEDBACK ELEMENT

- Element that use to send output signal to be compared with input signal by comparator in closed loop system.

2.6

OPEN LOOP CONTROL SYSTEM:

- Output does not affect the function of the entire system.

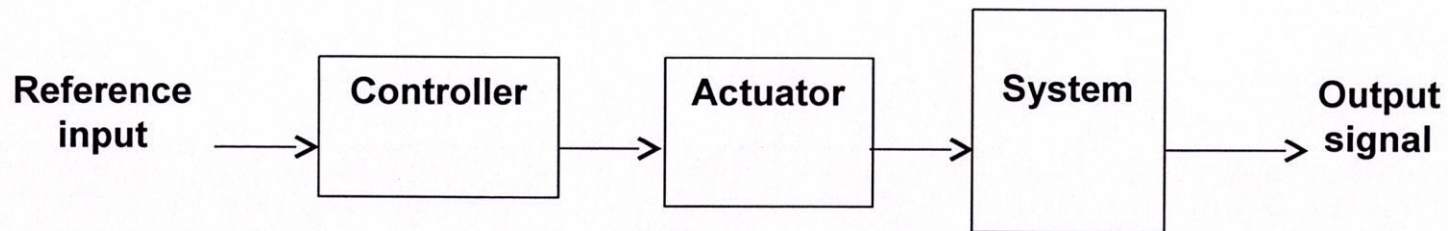


Fig. 1: Block diagram of Open loop control system

2.6.1 EXAMPLE: Street Lighting System

- Commonly a system that using timer.
- ON and OFF at specific time
(Night = ON and Day = OFF)
- Duration within ON and OFF is set up by timer.

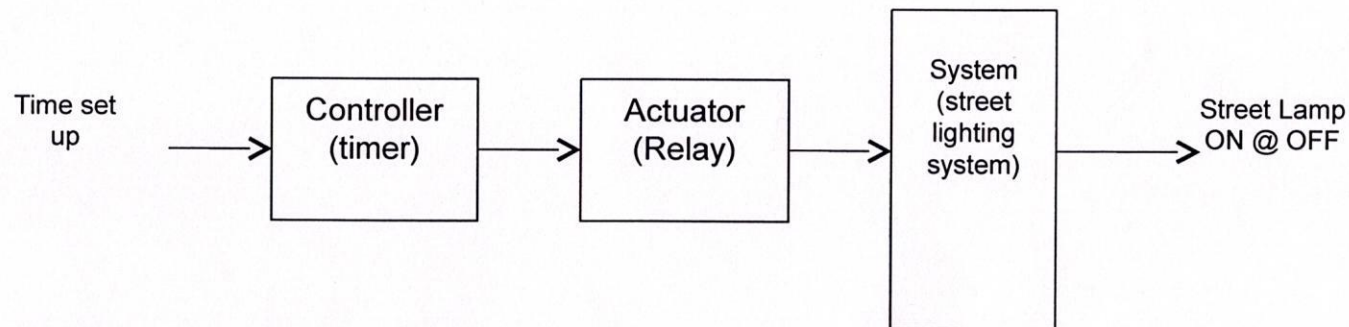


Fig. 2: Block diagram of Street Lighting System using Open loop control system

2.7

CLOSED LOOP CONTROL SYSTEM

- Also known as Feedback Control System
- System Output affect the control function of the entire system.

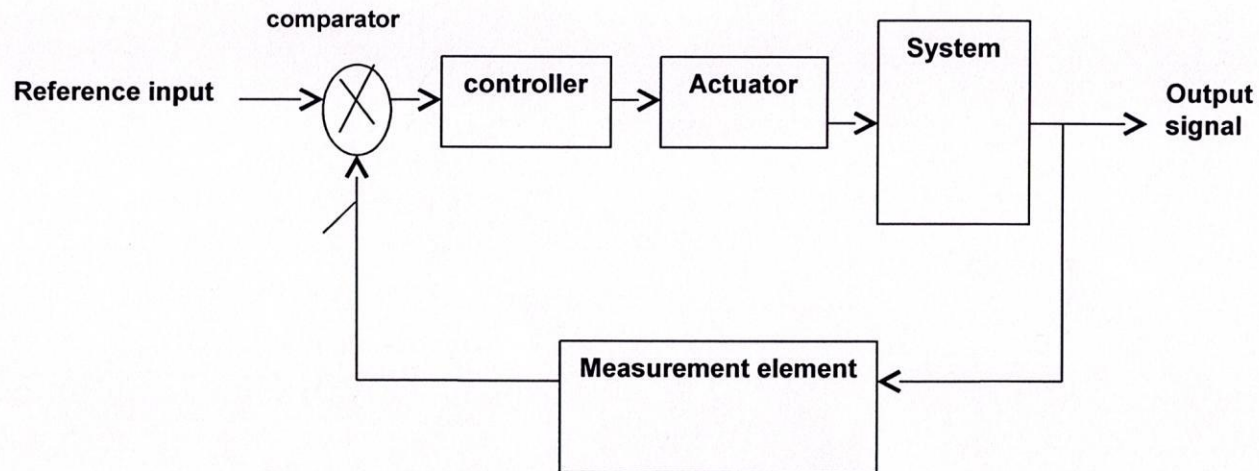
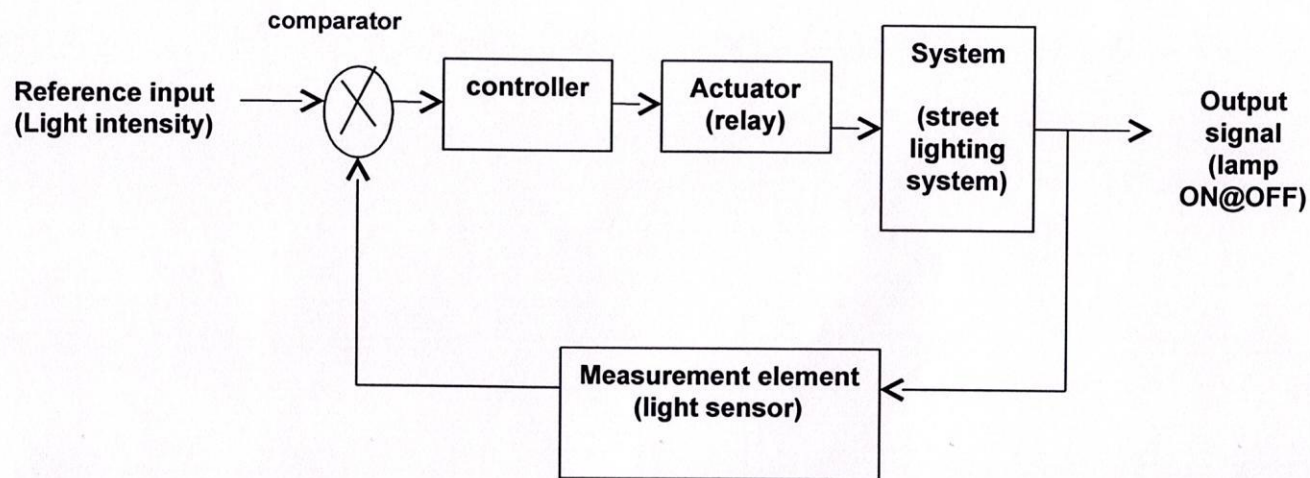


Fig. 3: Block Diagram of Closed Loop System

2.7 EXAMPLE : STREET LIGHTING SYSTEM

- Commonly a system that using sensor as input element.
- ON and OFF automatically as the light sensor detect the light regardless of the particular time.
- Dark = ON and Bright = OFF)



2.8 COMPUTERISED CONTROL SYSTEM

- A control system that use a computer as a controller.
- This system can be represented by the block diagram as in figure 5.

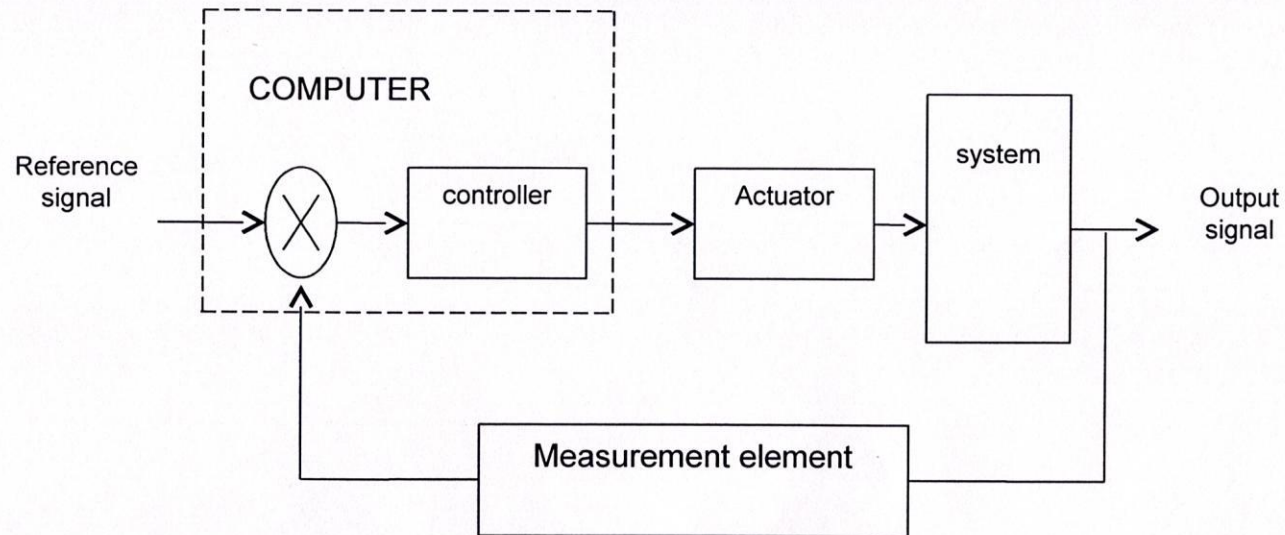


Fig. 5: Block Diagram of Closed Loop System

2.9 COMPARISON

Open Loop System (OLS)	Close Loop System (CLS)
Easy to design	The design is complicated or Complex.
The accuracy depends on the calibration elements	The system is very accurate.
less instability problem.	problems of instability.
Unable to reduce the impact of non-linearity.	Non-linearity effects can be minimized.

INTRODUCTION TO PLC

2. Explain PLC

- 2.1.1 Define PLC terminologies
- 2.1.2 Explain PLC background
- 2.1.3 Explain PLC functions
- 2.1.4 List and explain the types and advantages of PLC.

2.1.1 Define PLC

What is Programmable Logic Controller (PLC) ?

Definition: National Electrical Manufacturers Association
US (NEMA)

A PLC is a digital operating electronic apparatus which uses a programmable memory for internal storage of instruction for implementing specific function such as logic, sequencing, timing, counting and arithmetic to control through analog or digital input/output modules various types of machines or process.

Define PLC terminologies:

Several different terms used to described programmable controllers:

- i. PLC –Programmable Logic Controller (UK origin)
- ii. PC – Programmable controller (US origin)

Most referring to the functional operation of the machine.

PLC has been used in this text to avoid confusion with the personal computer.

2.1.2 Explain PLC background

PLC Development factors:

- needs for low-cost
- Flexible
- Easily commissioned/ smart usage

Historical Background:

In 1968, a group of engineers from General Motors developed the concept of PLC with an initial specification. The PLC must be:

- i. Easy to program.
- ii. Not need rewiring the control system if change the program.
- iii. Smaller in size, cheaper and high reliability.
- iv. simple construction and low maintenance
- v. Cost- competitive

2.1.3 PLC functions

CONTROL TYPE:	FUNCTIONS
Sequence Control	Conventional Relay Control Logic replacer Timers/ Counter PCB Card controller replacer Auto/Semi-auto/Manual control of machine and process.
Advanced/ Sophisticated Control	Arithmetic operation (+, -, ×, ÷) Information Handling Analog Control (Temperature, Pressure) P.I.D (Proportional Integral Derivation) Servo Motor Control Stepper Motor control

PLC functions:

CONTROL TYPE:	FUNCTIONS
Supervisory Control	<ol style="list-style-type: none"><li>i. Process monitoring and alarm.<li>ii. Fault Diagnostic and monitoring<li>iii. Interfacing with Computer (RS-232C/RS 422)<li>iv. Printer/ ASCII Interfacing<li>v. Factory Automation Networking<li>vi. Local Area Network (LAN)<li>vii. Wide Area Network (WAN)<li>viii. Factory Automation (F.A), Flexible Manufacturing System (F.M.S) & Computer Integrated Manufacturing (C.I.M).

PLC Size:

Small :

- it covers units with up to 128 I/O's and memories up to 2 Kbytes.
- Capable of providing simple to advance levels or machine controls.

Medium :

- Have up to 2048 I/O's and memories up to 32 Kbytes.

Large :

- The most sophisticated units of the PLC family. They have up to 8192 I/O and memories up to 750 Kbytes.
- Can control individual production processes or entire plant.

2.1.4 Types of PLC Construction:

Compact PLC

Modular PLC

PLC Plug-in Card

Manufacturer: OMRON, Allen Bradley,
Mitsubishi, NAIS,
Siemens, Toshiba, Festo etc.

2.1.4 Types of PLC Construction:

i. Compact PLC:

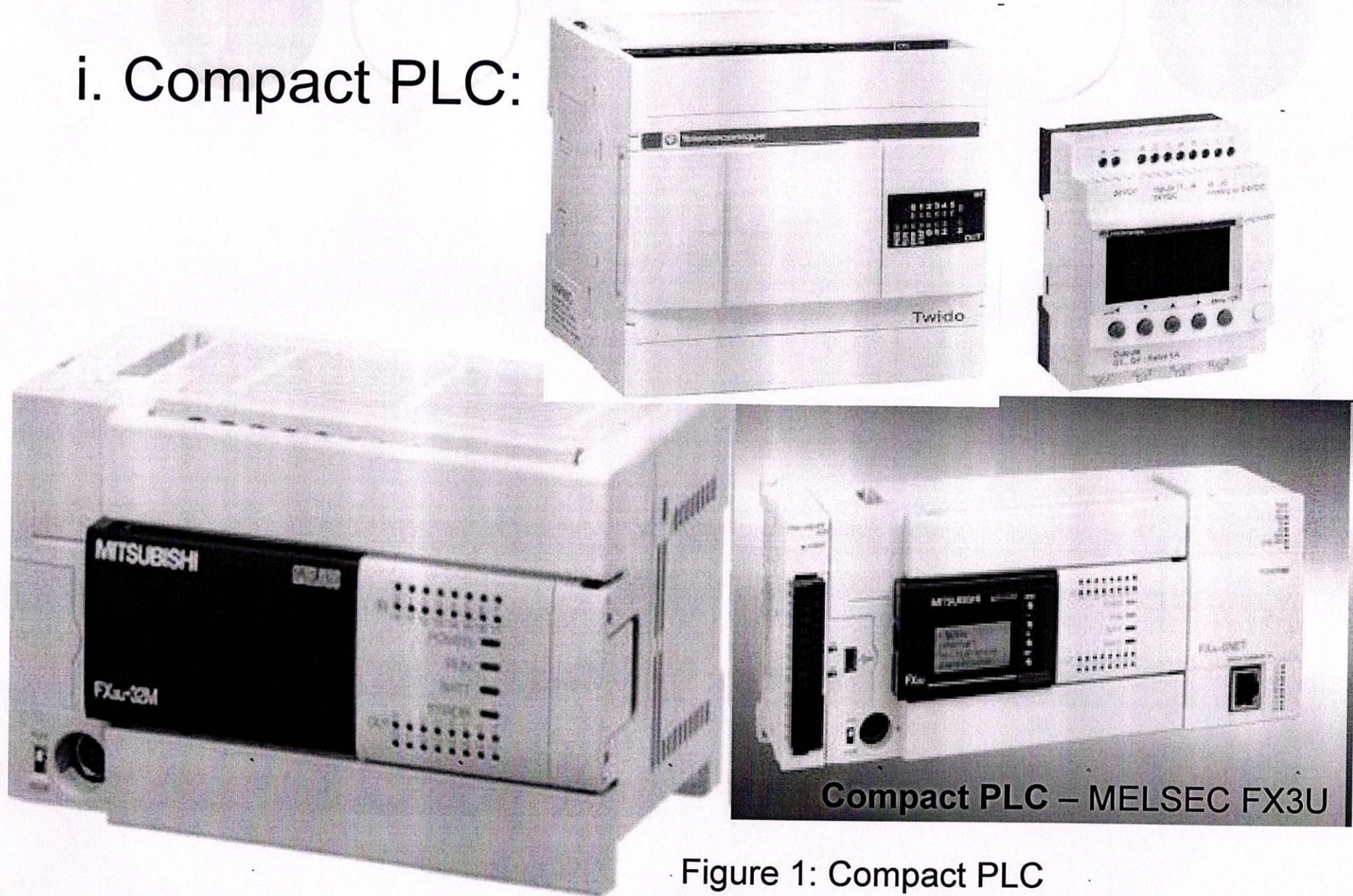


Figure 1: Compact PLC

i. Modular PLC

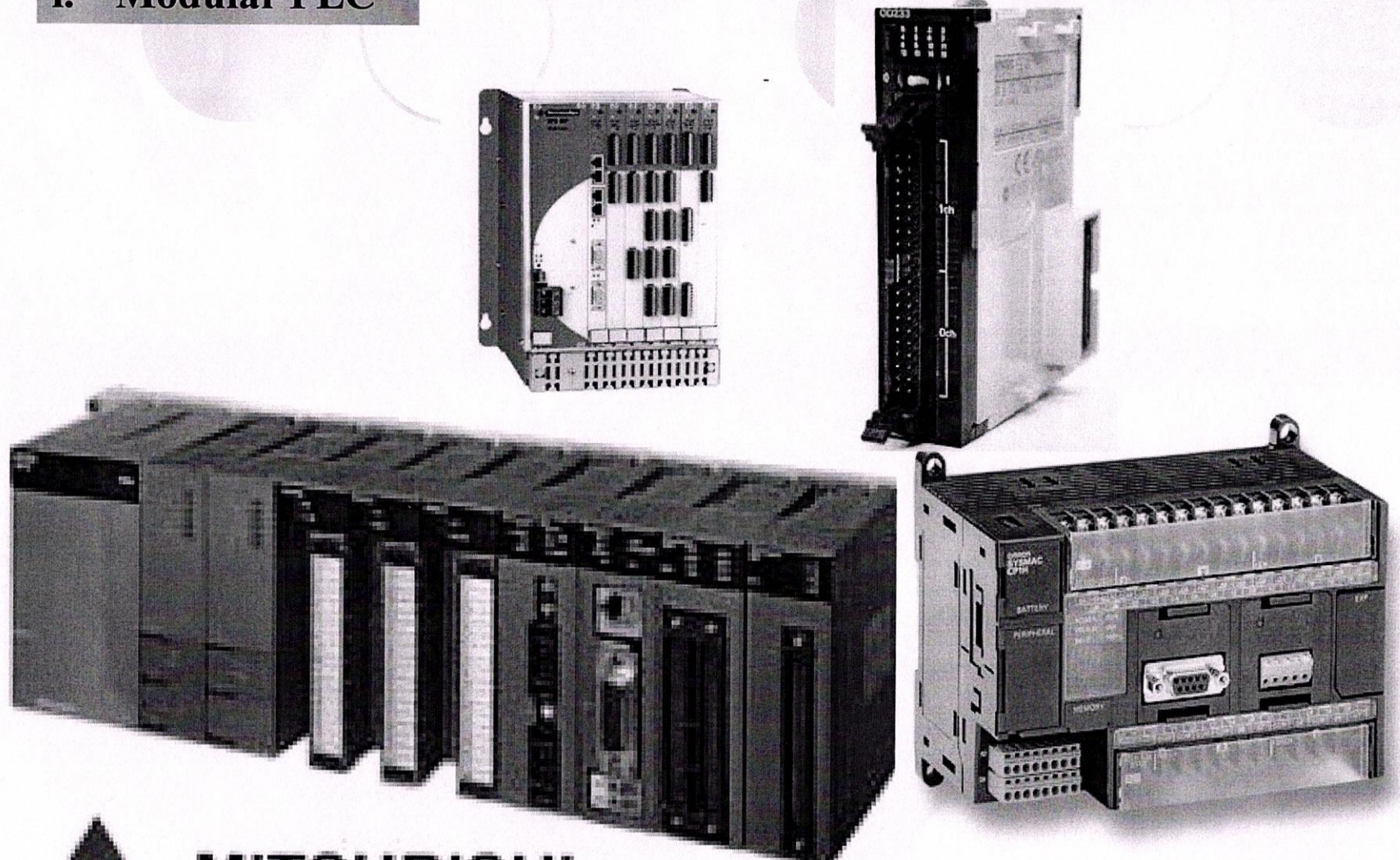


Figure 2: Modular PLC

iii. PLC Plug-in Card

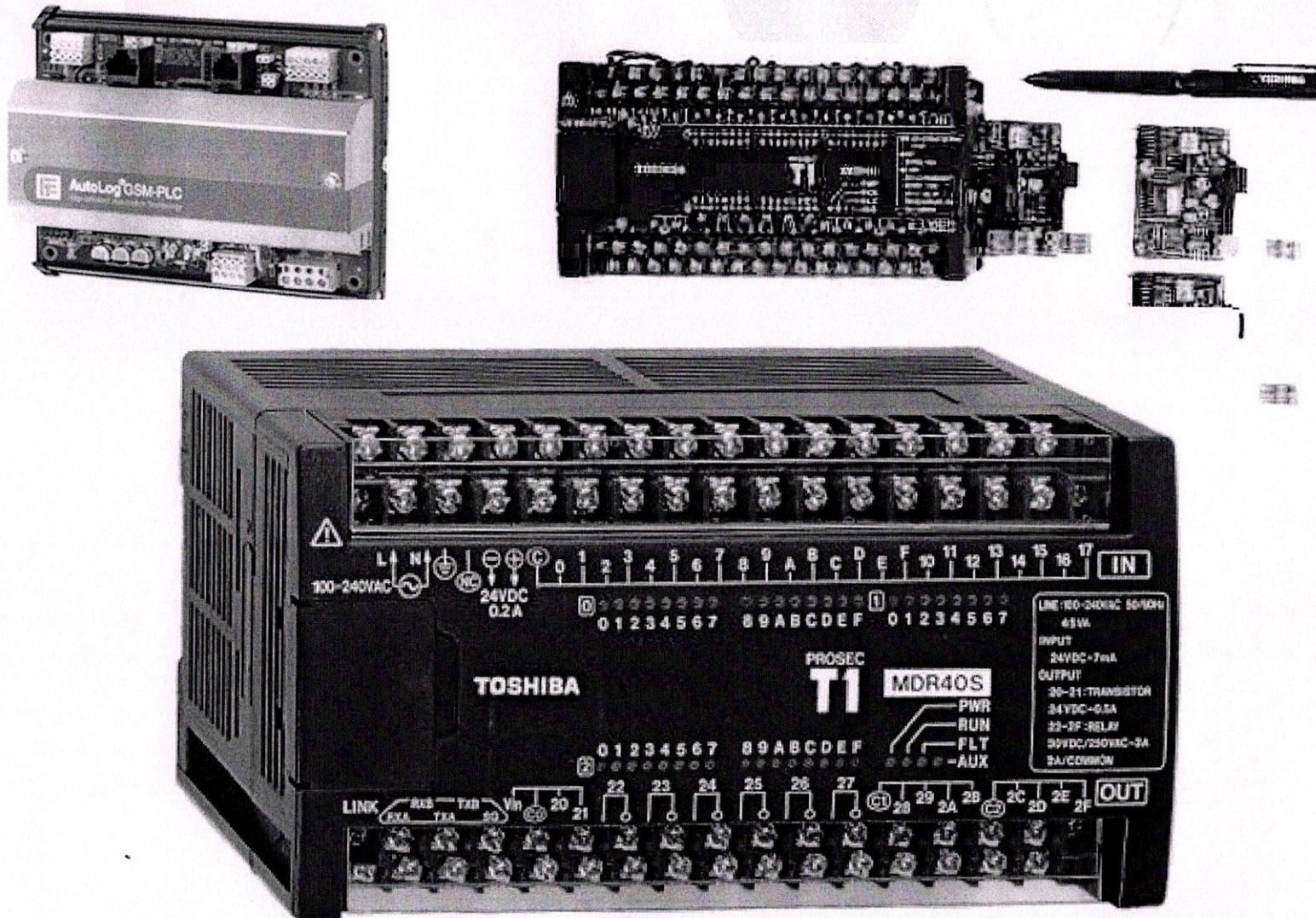


Figure 3: Plug-in Card PLC

ADVANTAGES OF USING PLC:

- Shorter project implementation time.**
- Easier modification**
- Project cost can be accurately calculated.**
- Shorter training time required.**
- Design easily changed using software** (changes and addition to specifications can be processed by software.
- A wide range of control application**
- Easy maintenance.**
- High Reliability**
- Standardization of Controller hardware.**
- Able to withstand Harsh plant/process environments** (Operate normally under severe conditions of temperature, humidity, voltage fluctuations and noises).

TOPIC 3

PLC HARDWARE DESIGN

3.0 PLC HARDWARE DESIGN

3.1 Processor Architecture for PLC:

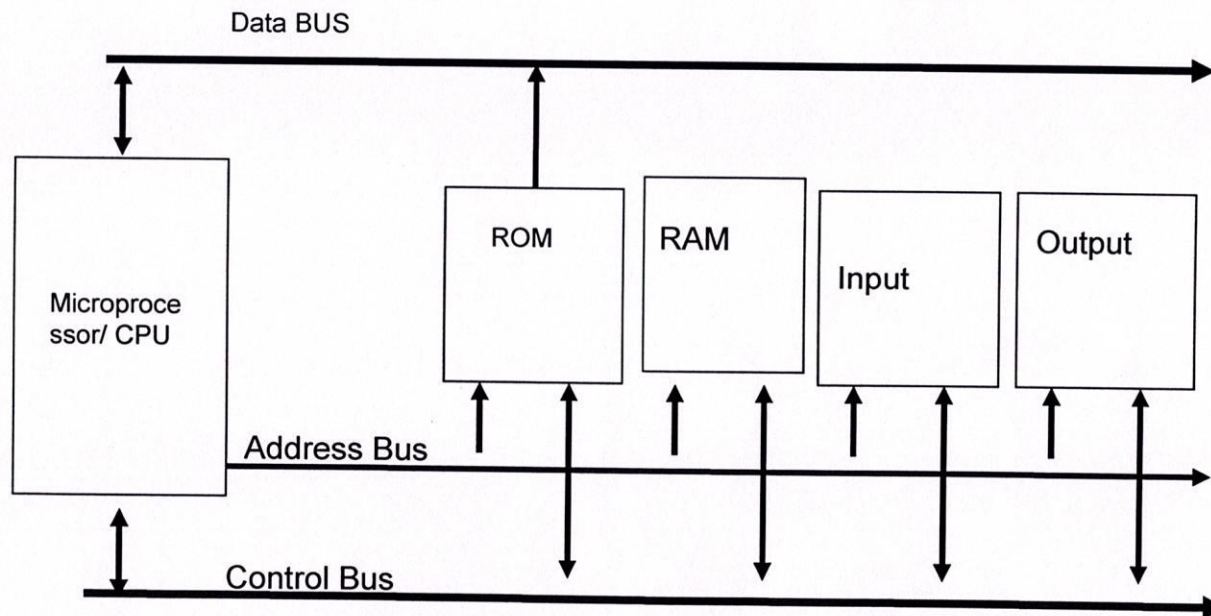


Figure 4: Design of Basic Microcomputer

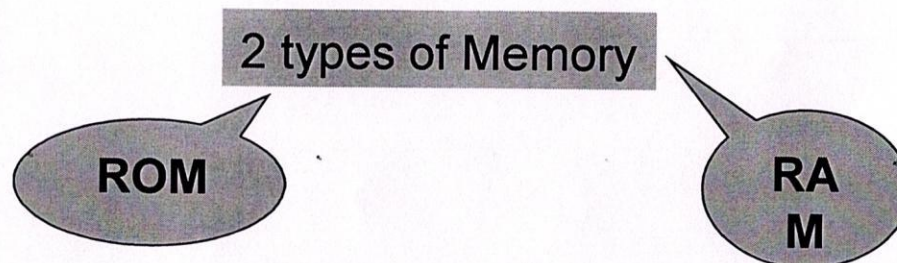
3.1.1 FUNCTION OF EACH BLOCK:

a. **Central Processing Unit (CPU)**

- The CPU controls, monitors and supervises all operations within PLC.
- It is also carries out programmed instructions stored in the memory.
- An internal communications highway also known as a bus system, carries information to and from the CPU, memory and I/O units under the control of the CPU.

b. Memory Unit

- For storage of programs.
- The user's ladder logic program, the state of I/O in the memory of PLC.
- The main program and the other programs necessary for the operation of PLC.
- The organization of the data and information in the memory is called memory map.



3.1.1 FUNCTION OF EACH BLOCK:

TYPES OF MEMORY:

RAM Random Access Memory	ROM Read Only Memory (read)
This memory can be read from and written to.	This memory can be read only
Storing all user's programs	Storing all system's program
Entire contents will be lost if power is switched off.	Memory content remain when the power is switched off.

c. Input/ Output (I/O) Unit

Input Unit:

Function as a medium that connects the external input devices


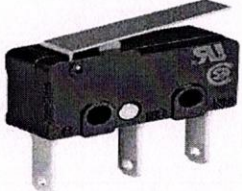
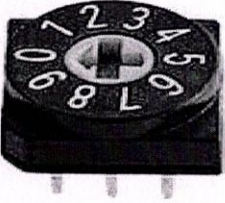
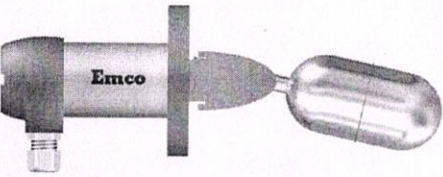

(Switch, sensor & timer)

Output Unit:

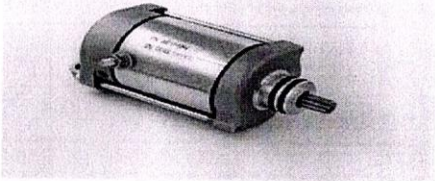
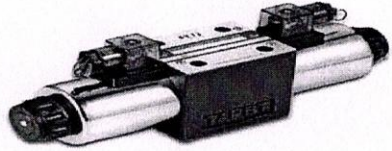



Function as a medium that connects the external output devices to the CPU within PLC.

(Lamp, motor & solenoid)

INPUT DEVICES:

Push Button	 JNB2-BC42
Limit Switch	
Thumbwheel SW	
Level SW	
<u>Flow SW</u>	

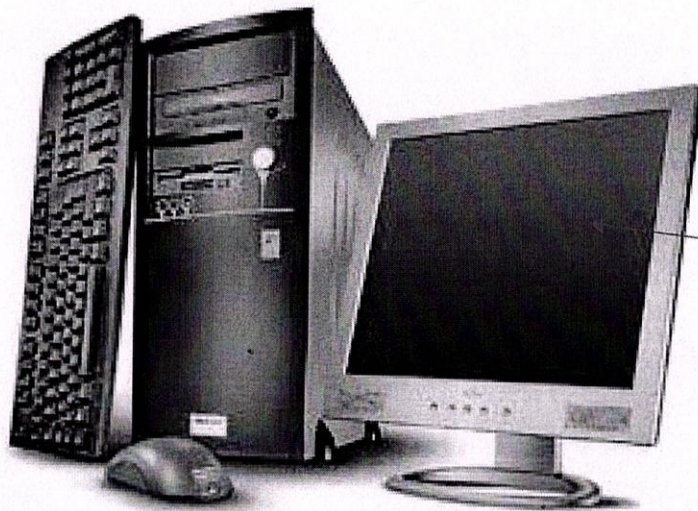
INPUT DEVICES:

Motor	
Solenoid	
LED Display	
Heater Coil	
Lamp	

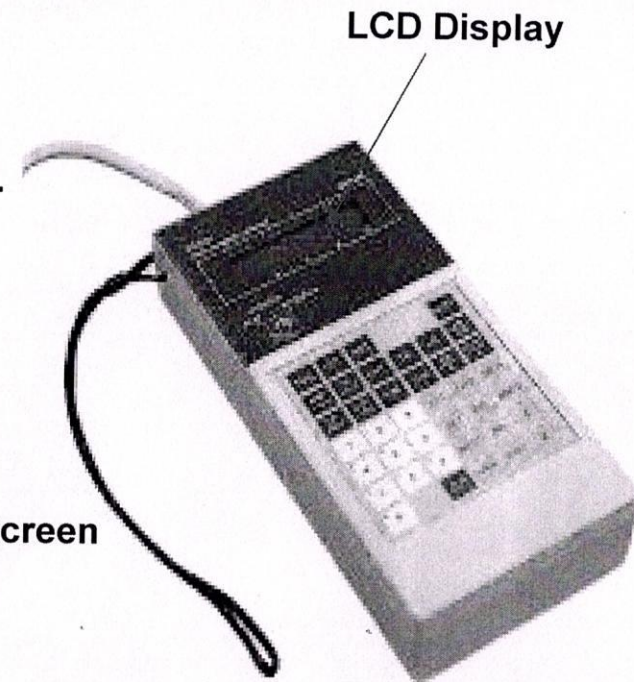
d. Display and Indicator Unit

Referring to PLC standard display Internal Relay:

- Console's LCD Display
if user use Mnemonic Code Programming.
- Monitor Screen
if user use software programming method.



Monitor Screen



LCD Display

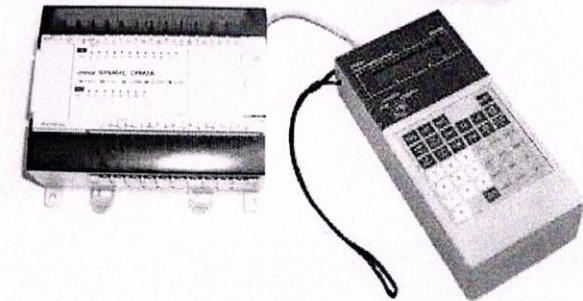
e. Housing Unit

Protect PLC circuit and internal component

Programming Unit

Consist of 2 devices:

- i. Programming Console
- ii. Computer



g. Secondary Storage Unit

This unit related to CPU where all program and information were kept.



h. Power Supply Unit:

Supplies DC power to the Central Processing Unit, Input Unit and Output Unit.

i. Printing Unit

Used to print control system programming that controlled by PLC wether graphically or text.



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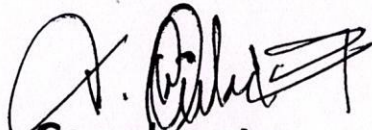
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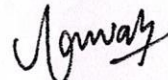
Presents this

CERTIFICATE OF PARTICIPATION

Mr. G. Sasidhar - Roll No - 17941A0210

For her active and invaluable participation during the conduct of Certification Courses on "PLC and Its Applications" held during 01st September to 19th September , 2020, in Department of Electrical And Electronics Engineering.


Coordinator


HOD

V. S. S. Murthy
Principal



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Kadapa, Andhra Pradesh, India-516 005

**Department of Electrical and Electronics Engineering
Certification Course on PLC and Its Applications
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1	NAGADASARI PRASANNA KUMAR	169Y1A0216	Agree	Yes	Strongly Agree	Yes	5	4	Need extra Explanation
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3	AKULA VENKATA SUNIL	179Y1A0202	Agree	Yes	Strongly Agree	Yes	5	4	Nil
4	ANKIREDDIPALLI VIVEKANAND AREDDY	179Y1A0203	Agree	Yes	Strongly Agree	Yes	4	5	Nil
5	BANDA SIVARAJ	179Y1A0204	Agree	Yes	Strongly Agree	Yes	5	4	Nil
6	BHUMIREDDY CHANDRAKALA (W)	179Y1A0206	Agree	Yes	Strongly Agree	Yes	4	5	Nil
7	DUGGISETTY JAGAPATHI BABU	179Y1A0207	Agree	Yes	Strongly Agree	Yes	5	4	Nil
8	GADDAM ANIL KUMAR	179Y1A0208	Agree	Yes	Strongly Agree	Yes	5	4	Nil
9	GAJJALAKON DUGARI RENUKA DEVI (W)	179Y1A0209	Agree	Yes	Strongly Agree	Yes	4	5	Need extra Explanation
10	GORANTLA SASIDHAR	179Y1A0210	Agree	Yes	Strongly Agree	Yes	4	5	Nil
11	KRISHNAM SNEHALATHA (W)	179Y1A0211	Agree	Yes	Strongly Agree	Yes	5	4	Nil

12	KURUBA LAKSHMIKANTH	179Y1A0212	Agree	Yes	Strongly Agree	Yes	4	5	Nil
13	MANCHALA SOWMYA (W)	179Y1A0214	Agree	Yes	Strongly Agree	Yes	5	4	Nil
14	MAYANA ABDUL SUHAIB KHAN	179Y1A0215	Agree	Yes	Strongly Agree	Yes	4	5	Nil
15	MEDA SANDEEP	179Y1A0216	Agree	Yes	Strongly Agree	Yes	4	4	Nil
16	MEKALA GANGADHARA	179Y1A0217	Agree	Yes	Strongly Agree	Yes	4	5	Nil
17	RAYAPU VENNELA (W)	179Y1A0221	Agree	Yes	Strongly Agree	Yes	5	4	Need extra Explanation
18	SANNAPURI VENKATESH	179Y1A0222	Agree	Yes	Strongly Agree	Yes	4	5	Nil
19	SUCHARITHA PANYAM (W)	179Y1A0225	Agree	Yes	Strongly Agree	Yes	5	4	Nil
20	SYED AZARUDDIN	179Y1A0226	Agree	Yes	Strongly Agree	Yes	4	5	Nil
21	SYED HAFEEZ PARVEZ	179Y1A0227	Agree	Yes	Strongly Agree	Yes	5	4	Nil
22	SYED SHAZIA TABASSUM (W)	179Y1A0228	Agree	Yes	Strongly Agree	Yes	4	5	Nil
23	YARRANAGU RAJESH REDDY	179Y1A0230	Agree	Yes	Strongly Agree	Yes	5	4	Nil
24	ATHINJERI RAJESH	189Y5A0201	Agree	Yes	Strongly Agree	Yes	4	5	Nil
25	BIJIVEMULA SUDARSHAN REDDY	189Y5A0202	Agree	Yes	Strongly Agree	Yes	5	4	Nil
26	BILLIPATI PAVAN KUMAR	189Y5A0203	Agree	Yes	Strongly Agree	Yes	4	5	Nil
27	BOLLINENI PRASANNA LAKSHMI (W)	189Y5A0204	Agree	Yes	Strongly Agree	Yes	5	4	Nil

28	CHABUK SAWAR MOHAMMED SUBHAN	189Y5A0205	Agree	Yes	Strongly Agree	Yes	4	5	Nil
29	KALAMALLA KALANDAR	199Y5A0205	Agree	Yes	Strongly Agree	Yes	5	4	Nil
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31	MODAPOTHU LA ANIL	199Y5A0207	Agree	Yes	Strongly Agree	Yes	5	4	Nil
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35	SAGILI PUSHPANAT HA REDDY	199Y5A0211	Agree	Yes	Strongly Agree	Yes	5	4	Nil
36	SHAIK SHABBIR BABA	199Y5A0212	Agree	Yes	Strongly Agree	Yes	4	5	Need extra Explanation
37	YAMAVARAM SWAPNA (W)	199Y5A0213	Agree	Yes	Strongly Agree	Yes	4	5	Nil
38	JADA NAVEEN KUMAR	189Y5A0213	Agree	Yes	Strongly Agree	Yes	5	4	Nil
39	JINKA MANOJ KUMAR	189Y5A0214	Agree	Yes	Strongly Agree	Yes	4	5	Nil
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41	KAMBHAM PAVAN KUMAR REDDY	189Y5A0216	Agree	Yes	Strongly Agree	Yes	4	5	Nil
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43	KARAPUREDDY MANOJ KUMAR REDDY	189Y5A0218	Agree	Yes	Strongly Agree	Yes	4	5	Nil
44	KODURU KUMAR	189Y5A0219	Agree	Yes	Strongly Agree	Yes	4	5	Nil
45	KONANGI CHANDU	189Y5A0220	Agree	Yes	Strongly Agree	Yes	5	4	Nil
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47	KUMARAKALVA BALAJI	189Y5A0222	Agree	Yes	Strongly Agree	Yes	5	4	Nil
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48	KUNDALA SIVASAI	189Y5A0224	Agree	Yes	Strongly Agree	Yes	5	4	Nil
50	KUSAM CHANDRA PRAKASH REDDY	189Y5A0227	Agree	Yes	Strongly Agree	Yes	4	5	Nil
51	LAKKIREDDY MADHU SAI	189Y5A0228	Agree	Yes	Strongly Agree	Yes	4	5	Provide PPT
52	LAVANUR REVANTH REDDY	189Y5A0229	Agree	Yes	Strongly Agree	Yes	5	4	Nil
53	LINGIREDDY SAI HARSHINI (W)	189Y5A0230	Agree	Yes	Strongly Agree	Yes	4	5	Nil
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83	YAMMANUR U VENKATA KAVITHA (W)	189Y5A0261	Agree	Yes	Strongly Agree	Yes	4	5	Nil


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