SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF
ELECTRONICS AND INSTRUMENTATION ENGINEERING

QUESTION BANK

VI SEMESTER

1907601 – LOGIC AND DISTRIBUTED CONTROL SYSTEMS

Regulation – 2019

Academic Year 2024 – 25
(EVEN SEMESTER)

Prepared by

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SUBJECT : 1907601 – Logic and Distributed Control System

SEM / YEAR: VI Semester / III Year EIE

UNIT I - PLC & SCADA

PLC: Evolutions of PLCs – Programmable Controllers – Architecture, I/O modules – Comparative study of Industrial PLCs. SCADA: Remote terminal units- Master station - Communication architectures.

PART - A

Q. No.	Questions	CO	BT Level	Competence
1.	Define PLC.	CO1	BTL 1	Remember
2.	Compare the PLC and PC.	CO1	BTL 2	Understand
3.	Point out the applications of PLC.	CO1	BTL 2	Understand
4.	Find four tasks in addition to relay switching operations that PLCs are capable of performing.	CO1	BTL 1	Remember
5.	List four distinct advantages that PLCs offer over conventional relay-based control systems.	CO1	BTL 1	Remember
6.	The programmable controller operates in real time. What does this mean?	CO1	BTL 2	Understand
7.	State two ways in which I/O is incorporated into the PLC.	CO1	BTL 1	Remember
8.	What are the two most common types of PLC programming devices?	CO1	BTL 1	Remember
9.	Compare PLC and SCADA.	CO1	BTL 2	Analyze
10.	List the hardware elements of SCADA.	CO1	BTL 1	Remember
11.	Summarize the I/O modules in PLC.	CO1	BTL 1	Remember
12.	Give five factors affecting the memory size needed for a particular PLC installation.	CO1	BTL 1	Remember
13.	How does the processor identify the location of a specific input or output device?	CO1	BTL 2	Understand
14.	Give the communication architecture for SCADA.	CO1	BTL 2	Understand
15.	What is the necessity to use master station architecture of SCADA.	CO1	BTL 2	Understand
16.	How does SCADA handle issues?	CO1	BTL 2	Understand
17.	What are ways can the loop power for current sensing input modules be supplied?	CO1	BTL	Understand
18.	Why most PLC modules use plug-in wiring terminal strips?	CO1	BTL 2	Understand
19.	What are the communication protocols used in SCADA?	CO1	BTL 2	Understand
20.	List the two main functions of a SCADA system.	CO1	BTL 2	Understand
21.	How do you select the PLC for a particular application?	CO1	BTL 2	Understand
22.	List any six brands of PLCs available in the market.	CO1	BTL 1	Remember
23.	List the SCADA software used in the industry.	CO1	BTL 1	Remember
24.	Compare SCADA and HMI.	CO1	BTL 2	Understand

PART – B

1.	Describe typical PLC input / output system connection with neat sketch.		(13)	CO1	BTL3	Apply
2.	Explain the following modules in RTU in detail.			CO1	BTL4	Analyze
	(i)	Digital input modules and output modules.	(10)			
	(ii)	Digital counter or accumulator modules.	(3)			

3.	Describe the typical parts of a programmable logic controller with neat sketch.	**(13)**	**CO1**	**BTL3**	Apply
4.	Discuss about the following configurations in PLC		**CO1**	**BTL3**	Apply
	(i) Fixed I/O configuration.	**(7)**			
	(ii) Modular I/O configuration.	**(6)**			
5.	Explain the components of SCADA with neat sketch.	**(13)**	**CO1**	**BTL5**	Evaluate
6.	In Remote terminal units explain the following		**CO1**	**BTL3**	Apply
	(i) Analog input modules.	**(7)**			
	(ii) Analog output modules.	**(6)**			
7.	Discuss about the input/output (I/O) section of a PLC in detail.	**(13)**	**CO1**	**BLT3**	Apply
8.	Write short notes on the following		**CO1**	**BTL4**	Analyze
	(i) SCADA hardware and Software.	**(9)**			
	(ii) SCADA and local area networks.	**(4)**			
9.	Describe the basic function of discrete AC input module involved in PLC.	**(13)**	**CO1**	**BTL3**	Apply
10.	Describe the software and hardware architecture of SCADA with neat sketch.	**(13)**	**CO1**	**BTL3**	Apply
11.	Asses the various types of PLC memory design with its input and output tables.	**(13)**	**CO1**	**BTL6**	Create
12.	Explain the principle of operation of discrete ac input and output modules used in PLC with suitable diagrams.	**(13)**	**CO1**	**BTL3**	Apply
13.	Evaluate the following Communication architecture of SCADA.		**CO1**	**BTL5**	Evaluate
	(i) Point-to-point architecture and Multi-point architecture	**(9)**			
	(ii) Relay station architecture	**(4)**			
14.	With neat sketch explain the typical structure of the master station in SCADA.	**(13)**	**CO1**	**BTL3**	Apply
15.	Explain the basic architecture of PLC with neat block diagram.	**(13)**	**CO1**	**BTL3**	Apply
16.	Explain in detail about Data Acquisition system.	**(13)**	**CO1**	**BTL3**	Apply
17.	Explain in detail about SCADA and write down its applications.	**(13)**	**CO1**	**BTL3**	Apply
	PART-C				
1	Explain the internal blocks of analog input and output modules of PLC.	**(16)**	**CO1**	**BTL5**	Evaluate
2.	Explain in detail about various hardware components present in PLC.	**(16)**	**CO1**	**BTL6**	Create
3.	Write typical discrete I/O module specifications and analog I/O module specifications.	**(16)**	**CO1**	**BTL6**	Create
4	With the help of neat diagram explain the operation of RTU hardware structure in SCADA.	**(16)**	**CO1**	**BTL5**	Evaluate
5.	Compare the different Industrial PLCs in detail.	(16)	**CO1**	**BTL5**	Evaluate

UNIT II - BASICS OF PLC PROGRAMMING (LADDER)

Basics of PLC programming – Ladder Logic – Relay type instructions – Timer/Counter instructions – Program control instructions – Data manipulation and math instructions – Programming Examples.Simulation of Ladder Logic Programs.

PART – A

Q.No	Questions	CO	BT Level	Competence
1.	What is the use of timers in PLC.	CO2	BTL 1	Remember
2.	Draw the symbol and state the equivalent instruction for each of the following: NO contact, NC contact, and coil.	CO2	BTL 1	Remember
3.	Draw the PLC ladder diagram for NAND gate.	CO2	BTL 1	Remember
4.	Draw a ladder diagram that will cause the output pilot light PL_2 to be turned ON when the selector switch SS_2 is closed, push button PB_4 is closed andlimit switch LS_3 is OPEN.	CO2	BTL 1	Remember
5.	When is the output of PLC counter energized?	CO2	BTL 2	Understand
6.	When is the output of a programmed timer energized?	CO2	BTL 2	Understand
7.	Draw a ladder logic diagram for single input timer.	CO2	BTL 2	Understand
8.	Perform a PLC ladder diagram to indicate light is to go ON when a count reaches 23 and go OFF when a count reaches 31.	CO2	BTL 2	Understand
9.	Under what condition is a ladder logic rung said to have logic continuity?	CO2	BTL 1	Remember
10.	Write a program that will cause output D to go to when switch A and switch B are closed or when switch C is closed.	CO2	BTL 2	Understand
11.	Express high-speed instruction used in data transfer operations.	CO2	BTL 2	Understand
12.	What is involved in a data compare instructions?	CO2	BTL 2	Understand
13.	Why a stop button must be normally closed and a start button must be normally open?	CO2	BTL 2	Understand
14.	What is the use of MCR instruction?	CO2	BTL 1	Remember
15.	Retentive instructions should not be placed within an MCR zone. Justify?	CO2	BTL 1	Remember
16.	List the advantages of jump instruction.	CO2	BTL 1	Remember
17.	List basic math functions that can be performed on PLCs.	CO2	BTL 1	Remember
18.	What standard format is used for PLC math instructions?	CO2	BTL 1	Remember
19.	What the jump to subroutine instruction allows the program to do?	CO2	BTL 1	Remember
20.	When are the immediate input and immediate output instructions used?	CO2	BTL 2	Understand
21.	What are the programming method in PLC?	CO2	BTL 2	Understand
22.	Compare the timers and counter functions of PLC.	CO2	BTL 2	Understand
23.	Draw the Ladder diagram for AND and NOR gates.	CO2	BTL 2	Understand
24.	Write the program for the given boolean Y = AB'+ C'.	CO2	BTL 2	Understand

PART - B

1.	Write short notes on the following relay-type instructions			BTL 3	Apply
	(i)	Examine If Closed (XIC)instruction	(4)		
	(ii)	Examine If Open (XIO)instruction	(4)		
	(iii)	Output Energize (OTE)instruction	(5)		
2.	Draw the ladder diagram using the timing block to turn on the motor after the delay of 5 seconds after pressing the start switch. And turn on the lamp after the delay of 5 seconds when the motor is off. Motor should be off after delay of 3 seconds when stop switch is turned on.		(13)	CO2	BTL 5	Evaluate

3.	Describe Retentive on-delay timer instructions in a PLC with example.	**(13)**	**CO2**	**BTL3**	Apply
4.	Develop the Ladder Logic Diagram for a motor with following: NO start button, NC stop button Thermal overload switch opens on high temperature, green light when running, and red light for thermal overload.	**(13)**	**CO2**	**BTL 5**	Evaluate
5.	Develop a Ladder Logic Diagram to ON & OFF a motor with single button; ON at first press and OFF at second press.	**(13)**	**CO2**	**BTL 5**	Evaluate
6.	When a start button is depressed, M goes on. Five seconds later N goes on. When stop is pushed, both M and N goes off. In addition 6 seconds after M and N goes off, fan F, which had previously been off, goes on. F remains on until the start button is again depressed, at which time it goes off.	**(13)**	**CO2**	**BTL 5**	Evaluate
7.	An automatic car parking system, when the parking area is full with 10 cars the red bulb at entry should ON to indicate it is full. If the number of car within the parking area is less than 10 the green bulb should ON to indicate that the space of parking is available.	**(13)**	**CO2**	**BTL 5**	Evaluate
8.	A timer is to turn on a fan switch 8.6 sec after a wall switch is turned ON. If the wall switch is turned OFF during the 8.6 sec. time interval, the timer is to reset to zero seconds, so that when the wall switch is again turned ON, the delay is the full 8.6 sec. Prepare Ladder Logic Diagram.	**(13)**	**CO2**	**BTL 5**	Evaluate
9.	List and explain various data move functions available in PLC.	**(13)**	**CO2**	**BTL 5**	Evaluate
10.	Discuss the difference in operation between following instructions a. MCR b. Timer – Retentive Timer	**(13)**	**CO2**	**BTL 5**	Evaluate
11.	Explain following PLC function with suitable example. a. Less than COMPARE function b. Jump to Subroutine function.	**(13)**	**CO2**	**BTL 5**	Evaluate
12.	Explain Timer and Counter instructions- TON, TOFF, RTO, CTU, CTD.	**(13)**	**CO2**	**BTL 5**	Evaluate
13.	Explain the following terms in the context of PLC. a. Execution time b. Isolation c. Processing time d. Dry contacts e. Master Reset	**(13)**	**CO2**	**BTL 3**	Apply
14.	Explain Branch instructions with examples in ladder logic programming.	**(13)**	**CO2**	**BTL 3**	Apply
15.	Explain the function of UP-DOWN counter with the help of timing diagram.	**(13)**	**CO2**	**BTL 3**	Apply
16.	Explain the data manipulation instructions used in PLC.	**(13)**	**CO2**	**BTL 3**	Apply
17.	Explain program control instructions used in PLC.	**(13)**	**CO2**	**BTL 3**	Apply
	PART C				
1.	A conveyor is supposed to have exactly 45 parts on it. Three indicating lights used to indicate the conveyor count status: less than 45, yellow; exactly 45, green: and more than 45, red. The count of parts on the conveyor is set at 45 each morning by an actual count of parts. There are two sensors on the conveyor. One is actuated by parts entering the conveyor, and the other is actuated by parts leaving. Develop a PLC program using compare functions.	**(15)**	**CO2**	**BTL6**	Create
2.	Develop the ladder logic diagram for the Bottle filling system application.	**(15)**	**CO2**	**BTL6**	Create
3.	Write a PLC program to control traffic lights.	**(15)**	**CO2**	**BTL 5**	Evaluate
4.	Construct a non-retentive timer program that will on a pilot light after a time delay period. Use a thumbwheel switch to vary the preset time-delay value of the timer.	**(15)**	**CO2**	**BTL6**	Create

5.	Write a ladder program to convert Celsius temperature to Fahrenheit. The operation of the program can be summarized as follows: 1. The thumbwheel switch connected to the input module indicates Celsiustemperature. 2. The program is designed to convert the recorded Celsius temperature in the data table to Fahrenheit values fordisplay. 3. The following conversion formula forms the basis for the program: $F = \left(\frac{9}{5} \times C\right) + 32$ 4. In this example, a current temperature reading of 60°C is assumed. 5. The MUL instruction multiplies the temperature (60°C) by 9 and stores the product (540) in address N7:0. 6. Next, the DIV instruction divides 5 into the 540 and stores the answer (108) in addressN7:1. 7. Finally, the ADD instruction adds 32 to the value of 108 and stores the sum (140) in addressO:13. 8. Thus 60°C = 140°F.	**(15)**	**CO2**	**BTL 5**	Evaluate

	UNIT III - PLC PROGRAMMING (OTHER LANGUAGES)				
	Functional block programming - Sequential function chart – Instruction list – Structured text programming – PLC controlled sequential Process Examples.				
	PART – A				
Q.No	**Questions**		**CO**	**BT Level**	**Competence**
1.	Name the four basic elements of an FBD.		**CO3**	**BTL 1**	Remember
2.	What is an Add-On instruction in FBD?		**CO3**	**BTL 1**	Remember
3.	Define structured text programming.		**CO3**	**BTL 1**	Remember
4.	What do you mean by Branching and Convergence in Sequential Function Charts?		**CO3**	**BTL 1**	Remember
5.	List some structured text operators.		**CO3**	**BTL 1**	Remember
6.	What do you mean by instruction list?		**CO3**	**BTL 1**	Remember
7.	Distinguish between structured text programming and Ladder programming.		**CO3**	**BTL 2**	Understand
8.	Examine the use of the assume data available indicator.		**CO3**	**BTL 2**	Understand
9.	How is a function block feedback loop created?		**CO3**	**BTL 2**	Understand
10.	Predict the use of Sequential function chart.		**CO3**	**BTL 2**	Understand
11.	What do the solid and dashed interconnecting lines between FBD function blocks indicate?		**CO3**	**BTL 2**	Understand
12.	Draw the logic gates symbol for AND gate and NAND gate in function block diagram.		**CO3**	**BTL 2**	Understand
13.	How does the program scan function for an FBD program?		**CO3**	**BTL 2**	Understand
14.	Compare the graphical representation of a function block diagram to that of a logic ladder diagram.		**CO3**	**BTL 2**	Understand
15.	What does the dot on an input or output pin of a function block indicate?		**CO3**	**BTL 2**	Understand
16.	Compare the functions of input and output reference tags in FBD.		**CO3**	**BTL 2**	Understand

17.	How an FBD program is initiated?		**CO3**	**BTL 2**	Understand
18.	Assess data latching as it applies to function block inputs.		**CO3**	**BTL 2**	Evaluate
19.	Which pins of a function block are inputs and which are outputs?		**CO3**	**BTL 1**	Remember
20.	How are the input and output parameter options for a function block set?		**CO3**	**BTL 2**	Understand
21.	Write the difference between functional block diagram and ladder logic.		**CO3**	**BTL 1**	Remember
22.	What are the 5 PLC programming languages?		**CO3**	**BTL 2**	Understand
23.	How PLC is used in sequential control?		**CO3**	**BTL 2**	Understand
24.	What are the 3 types of sequential circuits?		**CO3**	**BTL 2**	Understand
	PART - B				
1.	With neat sketch describe the typical Function Block Diagram Instruction and types of elements and boxes used in FBD Programming.	**(13)**	**CO3**	**BTL3**	Apply
2.	Explain the following Bit Logic instructions in FBD		**CO3**	**BTL 4**	Analyze
	(i) AND Logic Operation and OR Logic Operation	**(9)**			
	(ii) EXOR Logic Operation	**(4)**			
3.	Illustrate the use of the basic logic bit instructions in FBD program for the conveyor belt application. • In this application there are two sets of start and stop pushbuttons, one at the beginning of the conveyor and one at the end of the belt. These pushbuttons (PB-1 through PB-4) are wired to input points. • The two start buttons use NO contacts, and they are labeled PB-1 and PB-2. The two stop buttons use NC contacts, and they are labeled PB-2 andPB-4. • The control program allows the operator to start and stop the conveyor belt from either end. • There is a position detection switch (ZS-1) at the end of the conveyor to sense when a production part reaches the end of the conveyor. • This input signal is used by the PLC control program to automatically stop the conveyor when a part reaches the end of the conveyor.	**(13)**	**CO3**	**BTL3**	Apply
4.	**(i)** Write a FBD program to turn on a process pump, 2 seconds after the outlet valve on the pump has been opened by PLC output Q124.3. In this application, assume that the pump starter relay is connected to PLC output address Q124.4 and assume that internal bit B3/4 is used to stop the pump. **(ii)** Write a FBD program to count the number of parts rejected during a production operation and activate an alarm beacon if the number of rejected parts reaches 20 parts, during any production run. Assume that the part rejection signal is connected to input I124.1, a production line running signal is given by internal bit B3/2, a counter reset pushbutton is connected to input I124.3 and the alarm beacon is connected to outputQ124.4.	**(7)** **(6)**	**CO3**	**BTL5**	Evaluate

5.	**(i)** Write a FBD program to start a pump that will fill a process tank with fluid until a high level is reached in the tank. Assume that a normally opened fill tank pushbutton is wired to a discrete input module at I124.4 and a normally closed tank high-level switch is connected to input point I124.5 on a Siemens CPU314IFM. Also assume that the pump start relay is connected to output Q124.0 on the same Siemens PLC. **(ii)** Write a FBD program to control an electric motor. Assume that a NO start pushbutton is wired to an input point I124.0 and a NC stop pushbutton is wired to input I124.5 of a Siemens CPU314IFM. Also assume that output Q124.1 of the Siemens PLC will control a motor start relay, and there is an auxiliary motor start contact (NO) connected to the PLC input I124.1.	**(7)** **(6)**	**CO3**	**BTL5**	Evaluate
6.	**(i)** Write a FBD program to control the temperature of the fluid in a process tank close to 400°C. Assume that the heater contactor is connected to PLC output Q124.1, a temperature low switch set is connected to PLC input I124.0, and a temperature high switch is connected to PLC input I124.1 on a Siemens CPU314IFM. The temperature low switch is closed if the fluid temperature is below 395°C and opens at a temperature of 395°C or higher. The temperature high switch is closed if the fluid temperature is below 405°C and opens at 405°C or higher temperatures. **(ii)** Write a FBD program to activate a pump starter relay connected to output point Q124.0, if the inlet control valve FV-1 on a process tank is opened (input bit I124.0 = 1) and the process tank is at a high level (input bit I124.2 =1).	**(7)** **(6)**	**CO3**	**BTL5**	Evaluate
7.	Using instruction list write a program for **(i)** A signal lamp is required to be switched on if a pump is running and the pressure is satisfactory or if the lamp test switch isclosed. **(ii)** A valve that is to be operated to lift a load when a pump is running and either the lift switch operated or a switch operated indicating that the load has not already been lifted and is at the bottom of its lift channel.	**(6)** **(7)**	**CO3**	**BTL5**	Evaluate
8.	Write short notes on SFC				
	(i) With Single Divergence and Single Convergence.	**(7)**	**CO3**	**BTL 3**	Apply
	(ii) With Double Divergence and Double Convergence.	**(6)**			
9.	Write a SFC Program for Semiautomatic Metal Punch Control. The punch starts in the raised position or top position. When the operator depresses the start pushbutton (PB), the punch is lowered and it pierces the metal part at the lowest or bottom position. The cycle is completed when the control system raises the punch back to the top position and the operator removes the punched metal part and inserts a new piece of metal for the next operation. 1. The first process step is the punch at rest in the raised position. 2. The second step is the punch at rest waiting for a fault to be acknowledged. 3. The third step is the punch descending. 4. The final step is the punch ascending.	**(13)**	**CO3**	**BTL5**	Evaluate

10.	Write an IL program to turn off a conveyor belt on a production line after 150 parts have been produced. Assume the following: 1. Output bit Q124.3 = 0, turns off the conveyor belt; 2. Input bit I124.7 changes from 0 to 1 and then back to 0 each time a new part is produced; 3. A normally open (NO) pushbutton connected to input I124.2 is used to set the production count to150, 4. A NO pushbutton connected to input I124.3 is used to reset the counter to zero and stop the conveyor belt.	**(13)**	**CO3**	**BTL5**	Evaluate
11.	**(i)** Write an IL program to open a fill valve on a process tank to allow an ingredient to be added to the tank for 30 seconds. Assume that the fill valve is wired to PLC output point Q124.4 and a momentary normally open (NO) pushbutton connected to PLC input point I124.6 is used by an operator to open the fill valve. Use timer T3 and input bit I124.2 to reset the timer in the program.	**(13)**	**CO3**	**BTL5**	Evaluate
12.	Write an IL program to turn off a conveyor belt on a production line after 10 parts have been produced. Assume the following: 1. Output bit Q124.5 = 0, turns off the conveyor belt; 2. Input I124.6 changes from 0 to 1 and then back to 0 each time a production part is rejected; 3. Input I124.7 changes from 0 to 1 and then back to 0 each time a new part is produced; 4. A NO pushbutton connected to input I124.2 is used to set the production count to10; 5. A NO pushbutton connected to input I124.3 is used to reset the counter to zero and to stop the conveyor belt. Use counter number 4 in the IL program.	**(13)**	**CO3**	**BTL5**	Evaluate
13.	**(i)** List the basic statement types for ST program.	**(6)**	**CO3**	**BTL3**	Apply
	(ii) Explain conditional statements and iteration statements in Structured Text programming.	**(7)**			
14.	**(i)** Write a structured text program for the following: a tank is filled by opening valve 1, as long as level switch 1 is not triggered and the drain valve is closed. **(ii)** Write a structured text program to set the temperature of an enclosure by switches to the values 40, 50, 60, and 70, and switch on fan 1 when the temperature is 60 and fan 2 when it is70.	**(6)** **(7)**	**CO3**	**BTL5**	Evaluate
15.	Explain structured text implementation of conditional statements, iterative statements.	**(13)**	**CO3**	**BTL 2**	Apply
16.	Explain the iteration statements used in structured text.	**(13)**	**CO3**	**BTL 2**	Apply
17.	What is sequential function chart and what are its elements? Explain with relevant sketch.	**(13)**	**CO3**	**BTL 2**	Apply

	PART C				
1.	Write a FBD program to turn off a conveyor belt on a production line after 50 parts have been produced. Assume the following for the control program: 1. Output bit Q124.5 = 0, turns off the conveyor belt; 2. Input I124.1 is set to 1 each time a production part is rejected; 3. Input I124.2 is set to 1 each time a new part is produced; 4. A normally open (NO) pushbutton connected to input I124.6 is used to set the production count to 50,and 5. A NO pushbutton connected to input I124.7 is used to reset the counter to zero and to stop the conveyor belt.	**(15)**	**CO3**	**BTL5**	Evaluate
2.	Write an IL program that delays the starting of a process pump for 10 seconds to allow a valve in the discharge line of the pump to fully open. Assume that the Pump starter relay is wired to PLC output point Q124.2 and a normally open switch connected to input point I124.0 is used by an operator to start the pump.	**(15)**	**CO3**	**BTL 5**	Evaluate
3.	Examine how convergence is represented by an SFC with neat diagram.	**(15)**	**CO3**	**BTL5**	Evaluate
4.	**(i)** Write a FBD program to subtract the integer data in word MW20 from the integer data in word MW18 and store the result in word MW22 if the input bit I:124.0 is true. Then divide the result by 2 and store the final result in wordMW24. **(ii)** Write a FBD program to subtract a 32-bit floating point number in word MD70 from a 32-bit floating-point number in word MD74 and store the result in word MD78 if input I124.0 is set to 1. Then divide the result by 4.5 and store the final result in wordMD82.	**(8)** **(7)**	**CO3**	**BTL 5**	Evaluate
5.	Write an instruction list program for a counter to control a machine is required to direct 6 tins along one path for packaging a box and then 12 tins for packaging another box. A deflector might be controlled by a photocell sensor that gives an output every times a tin passes and also draw the functional block diagram.	**(15)**	**CO3**	**BTL5**	Evaluate

UNIT IV DISTRIBUTED CONTROL SYSTEM

DCS: Evolution & types – Hardware architecture – Field control station – Interfacing of conventional and smart field devices (HART and FF enabled) with DCS Controller – Communication modules – Operator and Engineering Human interface stations – Study of any one DCS available in market.General purpose computer in DCS.

PART - A

Q.No	Questions	CO	BT Level	Competence
1.	Define Distributed Control System (DCS) with an example.	**CO4**	**BTL 1**	Remember
2.	What do you mean by Local Control Unit?	**CO4**	**BTL 1**	Remember
3.	Name any two popular industrial communication protocols.	**CO4**	**BTL 1**	Remember
4.	What are the different functions performed by DCS?	**CO4**	**BTL 1**	Remember
5.	What are the display hierarchy used in the DCS system?	**CO4**	**BTL 1**	Remember
6.	Write the important features incorporated in high level engineering interface.	**CO4**	**BTL 1**	Remember
7.	What is the need can be satisfied in designing an industrial grade LCU?	**CO4**	**BTL 2**	Understand
8.	Predict the function of LCU.	**CO4**	**BTL 2**	Understand
9.	Give some application of DCS.	**CO4**	**BTL 2**	Understand
10.	Give some communication protocol used in distributed control system.	**CO4**	**BTL 2**	Understand
11.	What approaches are used in designing a redundant LCU architecture?	**CO4**	**BTL 2**	Understand

12.	Compare the configuration of the controller.		**CO4**	**BTL 2**	Understand
13.	Mention the prominent features of graphic display.		**CO4**	**BTL 2**	Understand
14.	Classify the factors to be considered for types of communication in DCS.		**CO4**	**BTL 2**	Understand
15.	How engineering workstation is different from operator work station in DCS?		**CO4**	**BTL 2**	Understand
16.	List the major architectural parameters to be considered for designing a controller for various industrial control applications.		**CO4**	**BTL 2**	Understand
17.	Write the important features incorporated in HLEI.		**CO4**	**BTL 2**	Understand
18.	Compare individual, centralized and distributive control systems.		**CO4**	**BTL 2**	Understand
19.	Generalize some of the bus standard used in process industries.		**CO4**	**BTL 2**	Understand
20.	What is the role of communication interfaces in DCS?		**CO4**	**BTL 2**	Understand
21.	Point out the various elements in DCS.		**CO4**	**BTL 2**	Understand
22.	List the various architecture of DCS.		**CO4**	**BTL 2**	Understand
23.	Classify the various redundant controllers in DCS.		**CO4**	**BTL 2**	Understand
24.	Compare LLHI and HLHI.		**CO4**	**BTL 2**	Understand
	PART - B				
1.	Describe the hierarchy of DCS with neat diagram.	**(13)**	**CO4**	**BTL 3**	Apply
2.	**(i)**Describe the evolution of DCS.	**(8)**	**CO4**	**BTL 3**	Apply
	(ii) Examine the requirements of LCU.	**(5)**			
3.	With neat diagram explain the various architecture of local control unit.	**(13)**	**CO4**	**BTL 4**	Analyze
4.	**(i)**Assess the process input output design issues in LCU.	**(7)**	**CO4**	**BTL 5**	Evaluate
	(ii) Assess the importance of local control unit in DCS.	**(6)**			
5.	**(i)**Generalize the process interfacing issues related to DCS.	**(7)**	**CO4**	**BTL 6**	Create
	(ii) Mention the important communication facility used in process industry.	**(6)**			
6.	Discuss about general building blocks of LCU with neat diagram.	**(13)**	**CO4**	**BTL 3**	Apply
7.	Compare the various features of hybrid, centralized and distributed control systems.	**(13)**	**CO4**	**BTL 3**	Apply
8.	Summarize the Importance of DCS and software used in DCS.	**(13)**	**CO4**	**BTL 5**	Evaluate
9.	Evaluate the security requirements and enlist the security design approaches for design issues in LCU.	**(13)**	**CO4**	**BTL 5**	Evaluate
10.	**(i)**List the features present in high level operator interfaces.	**(7)**	**CO4**	**BTL 3**	Apply
	(ii) Compare the advantage and disadvantages of low and high level operator interfaces.	**(6)**		**BTL 3**	Apply
11.	Explain the functional requirements of operator interfaces in monitoring process control and process record keeping.	**(13)**	**CO4**	**BTL 3**	Apply
12.	Describe in detail about smart field devices used in DCS controller with neat diagram.	**(13)**	**CO4**	**BTL 3**	Apply
13.	Discuss the low and high level operator interfaces in DCS.	**(13)**	**CO4**	**BTL 3**	Apply
14.	**(i)** Describe the functions performed by every block of DCS. **(ii)** Outline the communication system performance requirements of LCU.	**(7)** **(6)**	**CO4**	**BTL 3**	Apply
15.	Mention the advantages of low level and high level operator interfaces. Also explain the importance operator display used in process industry.	**(13)**	**CO4**	**BTL 3**	Apply
16.	Explain general purpose computers in DCS.	**(13)**	**CO4**	**BTL 4**	Analyze
17.	With neat sketches, explain different types of displays in DCS systems.	**(13)**	**CO4**	**BTL 4**	Analyze

PART C						
1.	Why HART is called a Hybrid protocol? Elucidate in detail the communication layer of HART protocol.		**(15)**	**CO4**	**BTL 5**	Evaluate
2.	**(i)**	Shared Communication plays critical role in DCS is it true? Justify.	**(9)**	**CO4**	**BTL 5**	Analyze
	(ii)	Asses the different architectural issues in DCS.	**(6)**			
3.	Develop an industrial case study of your choice and explain the role of DCS.		**(15)**	**CO4**	**BTL 6**	Create
4.	Compose the control, analysis and optimization in thermal power plant interfaced with DCS.		**(15)**	**CO4**	**BTL 6**	Create
5.	Describe the steps to create the control strategy for a process in DCS.		**(15)**	**CO4**	**BTL 4**	Analyze

UNIT V ADVANCED TOPICS IN AUTOMATION					
Introduction to Networked Control systems – Plant wide control – Internet of things – Cloud based Automation – OLE for Process Control – Safety PLC – Case studies: PLC - SCADA -DCS.					
PART - A					
Q.No	**Questions**		**CO**	**BT Level**	**Competence**
1.	Define Network Control System (NCS).		**CO5**	**BTL 1**	Remember
2.	Give the scope of OPC.		**CO5**	**BTL 2**	Understand
3.	Writ any examples of NCS.		**CO5**	**BTL 1**	Remember
4.	What are the fundamental of plant wide control?		**CO5**	**BTL 1**	Remember
5.	Point out the need of IOT.		**CO5**	**BTL 2**	Understand
6.	Give some applications for plant wide control.		**CO5**	**BTL 1**	Remember
7.	List the features of plant wide control.		**CO5**	**BTL 1**	Remember
8.	What is needed is a common way for applications to access data from any data source like a device or a database?		**CO5**	**BTL 2**	Understand
9.	What is Heterogeneous Computing Environment.?		**CO5**	**BTL 1**	Remember
10.	List the need for cloud based automation.		**CO5**	**BTL 2**	Understand
11.	What is the use of local server?		**CO5**	**BTL 1**	Remember
12.	What is remote server?		**CO5**	**BTL 1**	Remember
13.	List the features of cloud based automation.		**CO5**	**BTL 2**	Understand
14.	What is snowball effect?		**CO5**	**BTL 1**	Remember
15.	Write the steps involved in plant wide control.		**CO5**	**BTL 2**	Understand
16.	What is the use of Cloud based Automation.		**CO5**	**BTL 2**	Understand
17.	Write any two Cloud based software.		**CO5**	**BTL 2**	Understand
18.	List the advantages and disadvantages of IOT.		**CO5**	**BTL 2**	Understand
19.	What is meant by plant wide control?		**CO5**	**BTL 1**	Remember
20.	What are the benefits of cloud based automation?		**CO5**	**BTL 2**	Understand
21.	Write the applications of Networked Control systems.		**CO5**	**BTL 2**	Understand
22.	Compare traditional control theory and the theory of networked systems.		**CO5**	**BTL 2**	Understand
23.	What are the five main types of clouds computing?		**CO5**	**BTL 1**	Remember
24.	List any two innovative applications of cloud with internet of things.		**CO5**	**BTL 1**	Remember
	PART - B				
1.	Discuss in detail about the framework for networked control system.	**(13)**	**CO5**	**BTL 3**	Apply
2.	Explain in with neat diagram of Alice networked control system	**(13)**	**CO5**	**BTL 3**	Apply
3.	Analyze the various design procedure for plant wide design control.	**(13)**	**CO5**	**BTL 4**	Analyze
4.	Discuss in detail about the cloud based automation with typical application.	**(13)**	**CO5**	**BTL 3**	Apply
5.	Write detailed in about Process Control Information Architecture.	**(13)**	**CO5**	**BTL 3**	Apply
6.	Write short notes on layer and types of cloud.	**(13)**	**CO5**	**BTL 3**	Apply
7.	**(i)**Describe in detail about Internet of things with neat sketch. **(ii)** Summarize the various applications of IOT.	**(10)** **(3)**	**CO5**	**BTL 3**	Apply
8.	Discuss about the recent research trend in IOT.	**(13)**	**CO5**	**BTL 3**	Apply
9.	**(i)**Describe in detail with OPC, system integration in a heterogeneous computing environment. **(ii)**What is the need and list the benefits of OPC	**(10)** **(3)**	**CO5**	**BTL 3**	Apply
10.	With neat diagram, explain OPC Client/Server Relationship.	**(13)**	**CO5**	**BTL 5**	Evaluate
11.	How OPC Server object provides a way to access or communicate to a set of data sources.	**(13)**	**CO5**	**BTL 4**	Analyze

12.	Illustrate the applications of PLC with case studies.	**(13)**	**CO5**	**BTL 3**	Apply
13.	Explain the basic need of SCADA with case studies.	**(13)**	**CO5**	**BTL 6**	Create
14.	Describe about the safety PLC in detail.	**(13)**	**CO5**	**BTL 3**	Apply
15.	With a neat sketch, explain street lighting system using IOT.	**(13)**	**CO5**	**BTL 3**	Apply
16.	Draw and explain cloud computing architecture.	**(13)**	**CO5**	**BTL 3**	Apply
17.	Explain in any Case Study using SCADA, PLCs and Distributed Control Systems.	**(13)**	**CO5**	**BTL 4**	Analyze
	PART C				
1.	Assess the recent trends and various characteristics of IOT.	**(15)**	**CO5**	**BTL 5**	Evaluate
2.	Create the automation strategy of thermal power plant used in DCS.	**(15)**	**CO5**	**BTL 5**	Evaluate
3.	Explain the basic architecture of the Internet Of Things.	**(15)**	**CO5**	**BTL 6**	Create
4.	Create the automation strategy of water treatment plant used in DCS.	**(15)**	**CO5**	**BTL 6**	Create
5.	With a neat sketch, explain smart parking system using IOT.	**(15)**	**CO5**	**BTL 5**	Evaluate