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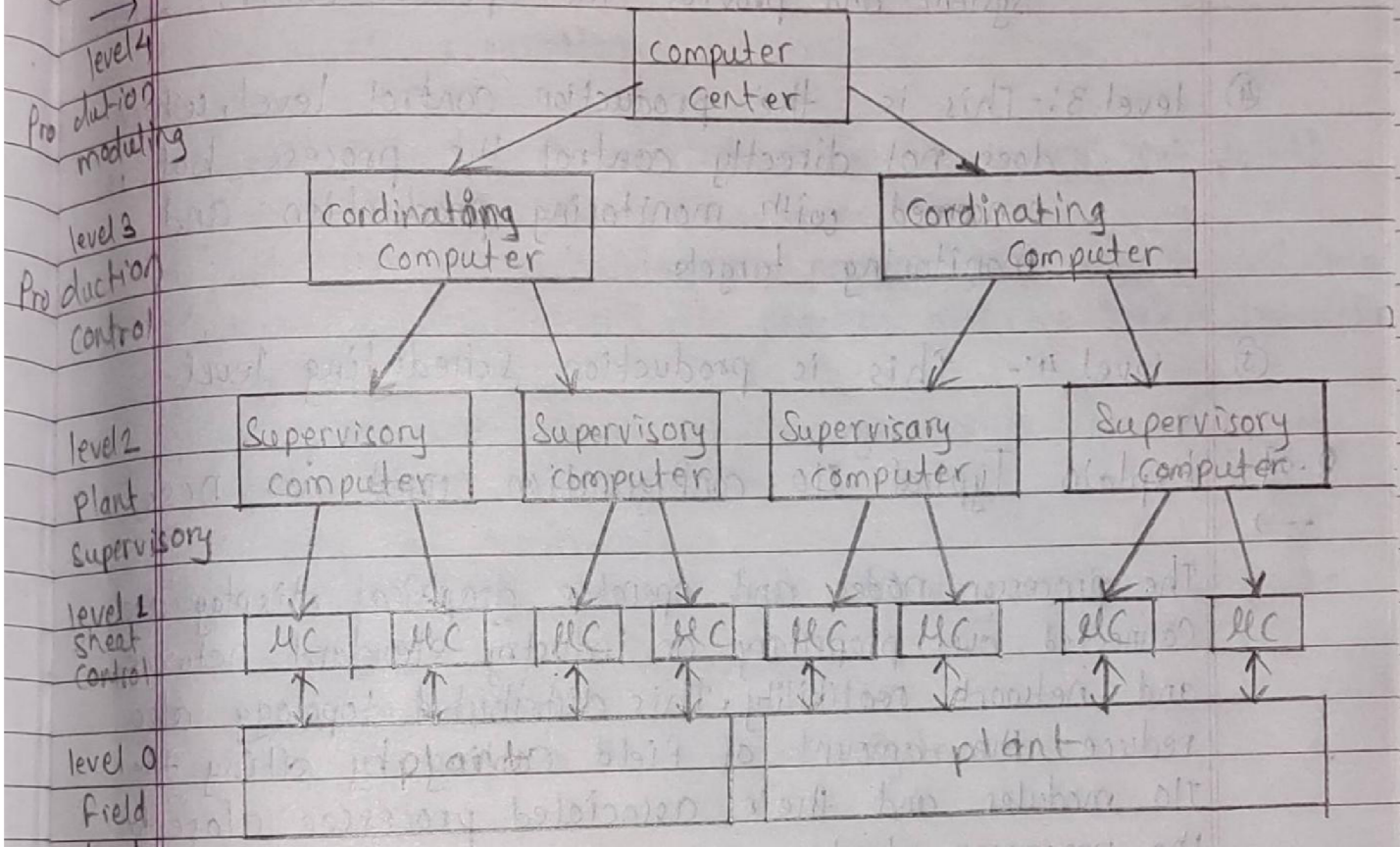
Q. 1] Explain the Architecture of typical distributed control System.

→



According to diagram,

① level 0:- It contains the field devices such as flow & temp sensors and final control elements such as control valves.

② level 1 :- It contains the industrialised input / output modules and their associated distributed electronic processors.

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③ level 2 :- It contains the supervisory computers, which collect information from processor nodes on the system and provide the operator control screens.

④ level 3 :- This is the production control level, which does not directly control the process, but is concerned with monitoring production and monitoring targets.

⑤ level 4 :- This is production scheduling level

Q.2] Explain Typical I/O configuration used in DCS's.

→

The processor nodes and operator graphical display are connected over propritary or industry standard network, and network realibility. This distributed topology also reduce the amount of field cabling by siting the I/O modules and their associated processor close to the processor plant.

The processor receive information from input module, process the information & decide control actions to be signalled by the output modules. The field input and outputs can be analog signals.

DCS are connected to sensor & actuators and use setpoint control to control the flow of material through the plant.

Large oil refineries and chemical plants have several thousand I/O points & employ very large DCS's

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Enlist different functions of distributed control system in plant automation

1] Automatic regulation.
2] Program Control
3] Remote Control (start, shutdown, change of set point)
4] Alarm & notifications management
5] Collection & processing of process and equipment data
6] Graphic presentation of process and equipment condition data
7] Detection and alarm of emergencies & deviation of process from preset limits.
8] Keeping of event log.
9] Registration of ~~process from~~ archiving of process parameters.
10] Report generation
11] Data exchange with external systems.

Q.4] Describe Hardware of DCS

→ With the increasingly amorphous nature of evolving DCS architecture and the ever expanding business model of DCS Suppliers. ARC made an effort to focus its definition of DSCC

At the hardware level, DCS begins ~~of~~ at the sensor I/O & extends all the way through controllers, application processors, workstations, pc's & networking equipment falling within the DCS control domain. PLC's and PLC type controllers sold as part of an integrated system offering, such as the siemens simatic PC's 7 & Rockwell logix integrated architecture system,

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are in our defination of DCS.

Excluded from the DCS hardware defination are field instruments, control valves, analytical devices all specify measurement equipment.

Q5] Explain typical software platform of DCS system

→

DCS software includes embedded controller software as well as some but not all software sold bundle with a system. DCS software includes control, HMI, system, management software, engineering & configuration software, and plant information management (PIM)

~~DSC~~ DCS HMI software can also perform functions such as I/O communication.

HMI software can also perform function as I/O communication.

The DCS definition ~~inc~~ excludes optional supervisary software that perform production management & advanced control functions & typically resides in a supervisary DCS sensor.

Q.6] Distinguish between PLC & DCS.

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→

Basis for Comparison	PLC	DCS
1) Basic	PLC is a ~~sig~~ single unit that discretely controls processes.	DCS is a complete system that control machine operations by carrying out various process ~~1975~~
2) Year of invention	1969	1975 -
3) Architecture	Simple	Comparatively Complex.
4) Replaced	Electromechanical relays	single loop controller
5) Programmed	According to desired ~~appl~~ application	Built in control function configured application wise
6) Controls	Machine	plant system.
7) controller type	centralized (at RTIS station)	De-centralized.
8) Scan time	10 miliseconds or less	100-500 miliseconds.
9) Controlling type	Discrete	Regulatory
10) Responce time	fast	Comparatively slow.
11) I/o terminals	less	More
12) Heart of system	in PLC based system - PLC	In DCS - HMI
13) Trouble-shooting	Difficult	Easy
14) Human interaction	Minimum	comparitive more.
15) Initial cost	Not expensive	expensive.
16) Flexibility	less	comparitive more
17) utilized for	Dedicated processes	complex process.

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Q. 7) What are the advantages of DCS over PLC in Industrial Automation?

→ — DCS are particularly in very large manufacturing operations where thousands of control loops need to be monitored in real time.

— Human engineers cannot manually monitor these many individual systems, which is why an automated central system is required.

— The DCS enables applications such as production scheduling, preventive maintence scheduling & information exchange.

— A DCS facilitates the geographical distribution of subsystems throughout your plant, used correctly, a DCS can greatly monitor or improve operational features such as.

~~Efficiency~~
efficiency
Risk of subsystem failure (and isolate a failed subsystem for maintenance)
Reporting
Safety
Security.

DCS is used as the central brain that monitors, supervises & sends instructions to potentially thousands of PLC at once.

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Q.8] What is Redundancy in DCS?

→ The mean time between failure (MTBF) of any system dependent upon certain critical components may be extended by duplicating those components in parallel fashion, such that the failure of only one does not comprises the system as a whole this is called Redundancy

- In DCS Redundancy processors, network cables & even I/o channels may be equipped with "hot stand by" duplicates ready to assume functionality in the event the primary component fails.

- Redundancy tends to extend the MTBF of a system without necessarily extending its service life.

- DCS is equipped with redundant microprocessor control modules if its rack will exhibit a greater MTBF because a random microprocessor fault will be covered by the presence of spare microprocessor module.

Q.9] What are the basic element of DCS?

→

DCS is included with basic elements such as engineering, workstation, operating station or HMI, process control unit, smart devices & communication system.

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Q.10] Explain following components used in DCS
1) Process variables
2) Software variables,
3) Tags.

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Q.11] Why DCS is called distributed?

→ Distributed control system first emerged in large, high value, safety critical process industries and were attractive because the DCS manufacturer would supply both the local control level and central supervisory equipment as an integrated package thus reducing design integration risk.

Q.12] Which programming languages is used in DCS?

→ Programming languages used in dcs are following.

① Instruction List (IL)
② Ladder Diagram (LD)
③ Functional Block diagram (FBD)
④ sequential functional chart (SFC)
⑤ Structured Text (ST)
⑥ Continuous function chart (CFC)

Q.13] How Human Machine Interface (HMI), Alarms, Trends, Databases.

→

HMI :-

HMI is a user interface that connects a person to a machine, system or device.
A DCS is a process control system that uses a network to interconnect sensors, controllers, operator terminals & actuators. A DCS typically contains one or more computers for control and mostly

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use both proprietary interconnections and protocols for communication SCADA may be called HMI.

Alarms:-

A DCS alarm is a displayed message usually coupled with an audible horn ~~an~~ that is automatically generated whenever a predefined condition is detected such as a faulty instrument or ~~can~~ an abnormally high or low measurement. The purpose of alarm is to draw the operator's attention ~~to~~ so ~~mtg~~ mitigating actions can be taken.

Current trends in DCS:-

1) I/O capabilities and virtualization are major drivers.
2) Remote I/O Enclosures.
3) Virtualization of Human machine Interface.
4) electronic ~~marshe~~ marshalling
5) Rapid Integration of skid-mounted systems.
6) Virtualization of DCS support systems.
7) virtualized DCS Project development.

Q.14) Explain Sequential controllers for Batch processing?

→

Sequential control is crucial in many control application as in chemical batch processes.
A sequential control procedure can be represented graphically by one of the following two methods:-

1) A state diagram, also denoted a state machine
2) A sequential flow chart.

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Q.15) Distinguish between SCADA and DCS.

→ DCS is process oriented while SCADA is data acquisition oriented, DCS is process state driven while SCADA is event driven, DCS is commonly used to handle operations on single locale, while SCADA is preferred for applications that are spread over a wide geographic location DCS operator stations are always connected to its IO, while SCADA is expected to operate despite failure of field communications.