CAM FAQ

CH:-1 Fundamentals of CAM

Q1/ Explain the concept of CAM.

Ans/ * CAM :- Computer Aided Manufacturing

⇒ " Concept of CAM :-

- The use of computer systems to plan, mange, and control the manufacturing operations through the direct or indirect computer interface with the manufacturing machine is known as computer Aided manufacturing. [CAM]".

- CAM is related to all the activities of manufacturing & this activities ensures the optimum utilization of resources, i.e man, machine, material, Methods & money.

- The activities associated with CAM are:-

1) Selection of optimum cutting tools.
2) Selection of cutting parameters.
3) Selection of optimum sequence of machines.
4) Generation of part programs for manufacturing the parts.
5) Cost estimation.
6) Material requirement planning.
7) Capacity planning.
8) Shop floor control. [Line Balancing].

- Computer aided manufacturing ensures to produce items with minimum cost & time but with good quality.

⇒ **Advantages of CAM :-**

1] Reduction in inventory.
2] More efficient use of factory and warehouse space.
3] Reduction in machine setup time.
4] Reduction in direct & indirect labour.
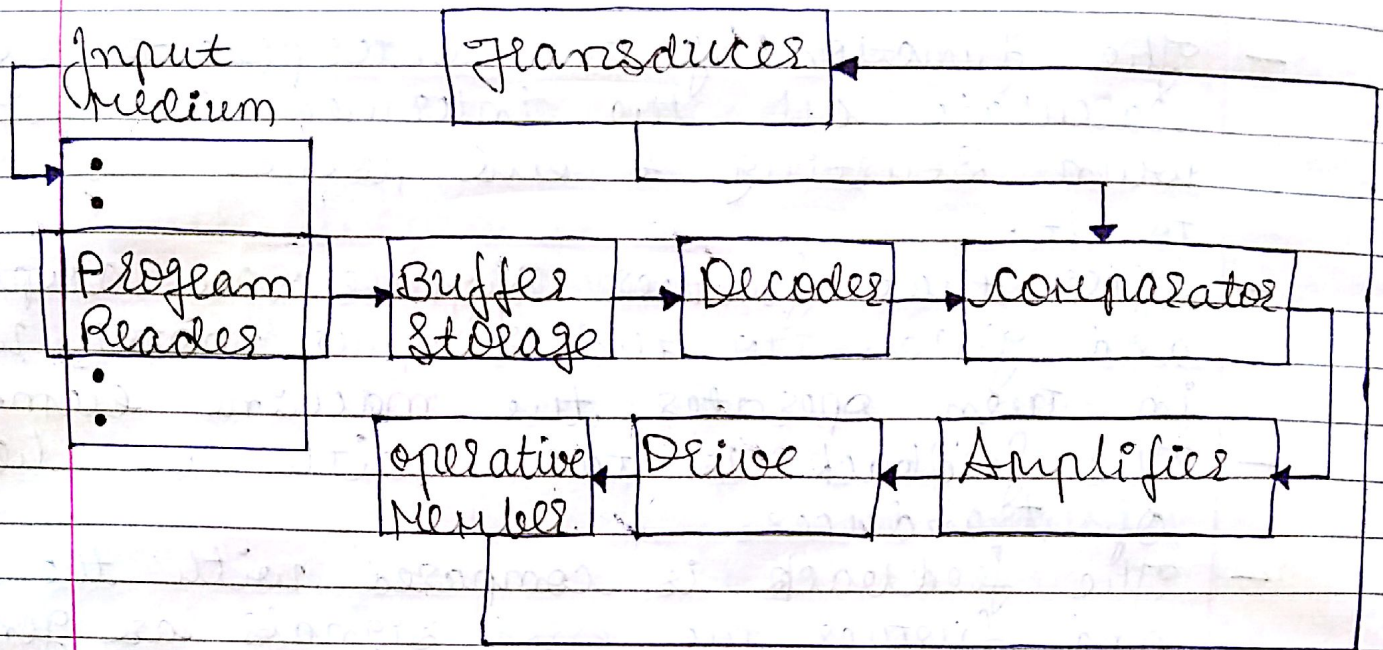5] Reduction in manufacturing lead times.

⇒ **Disadvantages of CAM :-**

1] The cost of Hardwares & Softwares uses in CAM are high.
2] Highly trained manpower is required to operate the CAM system.

Q2] Explain the concept of NC system.
Ans → **Concept of NC [Numerical Control] :-**

- Numerical control is the type of control system used for operating machine.
- Numerical control machine, as name suggests the input to the machine is given in the form of Alpha-Numeric characters.
- E.g. If a tool on a lathe machine is to be moved 10 mm along the bed then the program is :-

$$N10 \ G01 \ X10;$$

- fig (A) shows schematic block diagram of NC system.

Def:- "A method of automation in which various functions of m/c tools are controlled by letters, numbers & symbols is called NC m/c Tools."
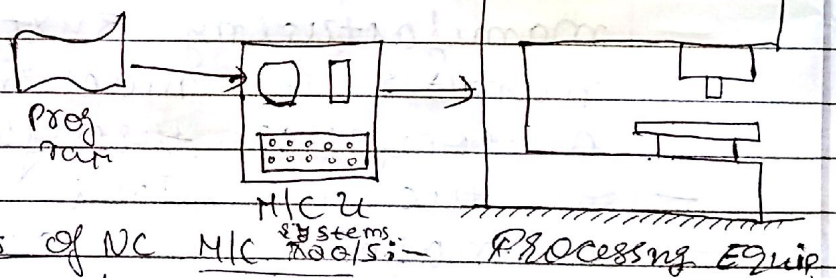
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        ┌──────────────┐      ┌──────────────┐
        │ Input        │      │ Transducer   │◄─────────┐
        │ Medium       │      └──────────────┘          │
  ┌────►│   ·          │           │                    │
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  │  ┌──────────┐  ┌──────────┐ ┌────────┐ ┌─────────────┐
  │  │ Program  │─►│ Buffer   │►│ Decoder│►│ Comparator  │
  │  │ Reader   │  │ Storage  │ └────────┘ └─────────────┘
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  │     │ operative │◄│ Drive  │◄│ Amplifier   │◄──┘
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fig(A):- Block Diagram of NC System

- The Three important parts of NC System are :-

1) Program.
2) Controller Unit.   Prog ram
3) Machine Tool.

m/c u systems

Elements of NC m/c Tools:-   Processing Equip

- In NC machines, the program is punched on the tape.

- The data on the tape is in the form of binary codes.

- Tape readers read the data & it is stored in a buffer to compensate non-uniform reading speed of the reader.

- Decoded data is given to interpolator.

- The function of the interpolator is to calculate all the intermediate positions when starting & end points are given to it.
- After that further signals are amplified and given to the stepper motor, which in turn operates the machine element.
- The feedback is taken with the help of tranducers.
- The feedback is compared with the input and further the error signals are generated to move the operative numbers till the output matches the input.

Q3) Explain DNC System.

Ans) DNC [Direct Numerical Control]:—

- Direct Numerical Control [DNC] is a manufacturing system in which large number of machines are controlled by a computer through direct connections.
- All the machines are linked through a main frame computer which sends the information to individual machines as and when required.
- The part programs for all the components, which are to be manufactured on the machines in DNC systems, are stored in the memory of the computer.
- When a machine needs control commands, they are communicated by the computer immediately.

— The DNC System has four components:-

1) Central Computer.
2) Bulk memory.
3) Set of Machines.
4) Telecommunication Lines.
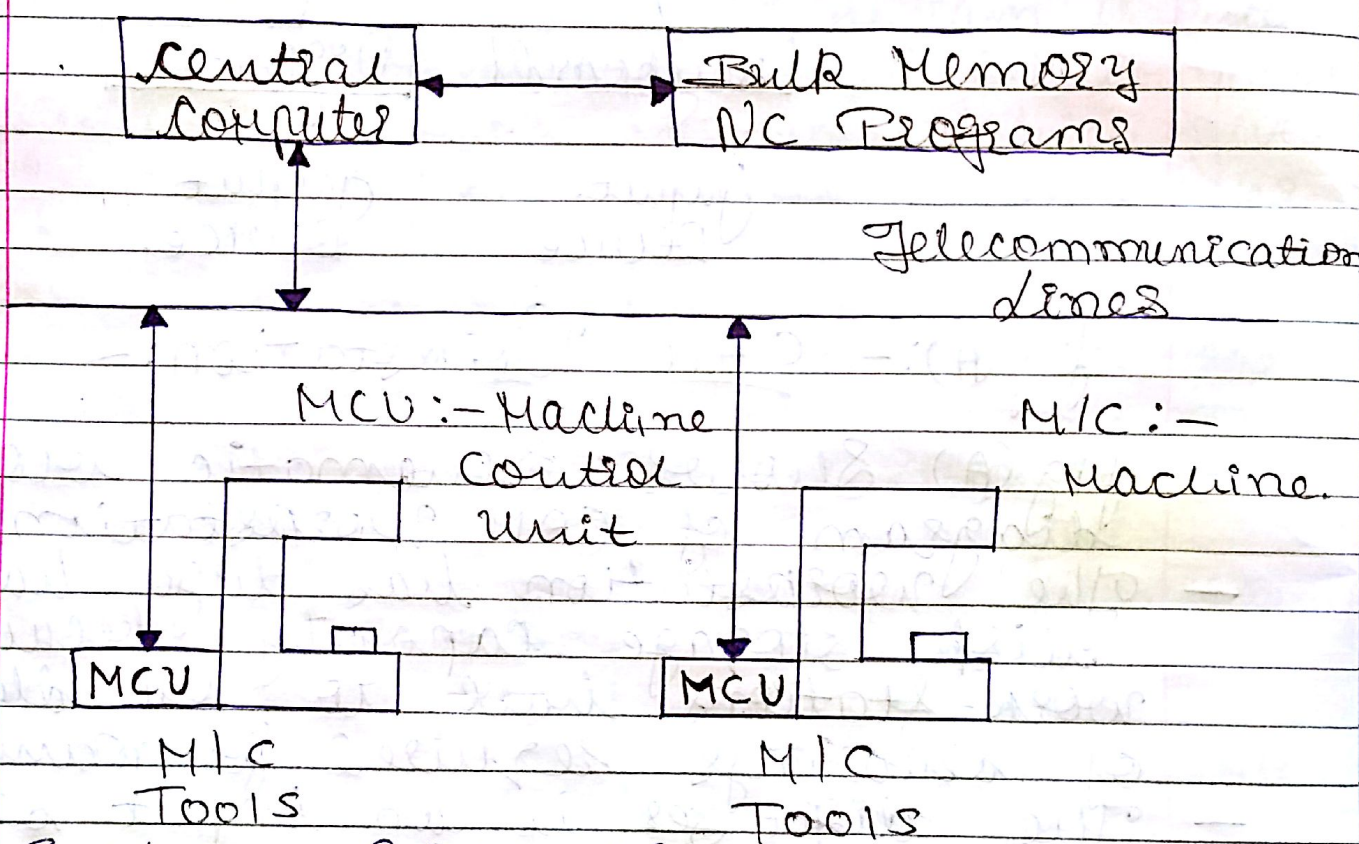
Q4] Explain CAM Workstation.

Ans] ★ CAM Workstation:-

— A normal personal computer can't be used efficiently for CAM application.
— In order to get rid of slow speed of PC's workstations are used.
— These are normally Intel Pentium family processors running upto 3GHz.

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        ┌─────────────────┐
        │ Plotters/Printers│        output
        └────────▲────────┘        Device.
                 │
output Device.   │
┌──────────┐  ┌──────────────────┐
│ Monitor  │◄─│ Central Processing│
│ Display  │  │ Unit.            │
└──────────┘  └───▲──────────▲───┘
                  │          │
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               Input      Input
               Device     Device.
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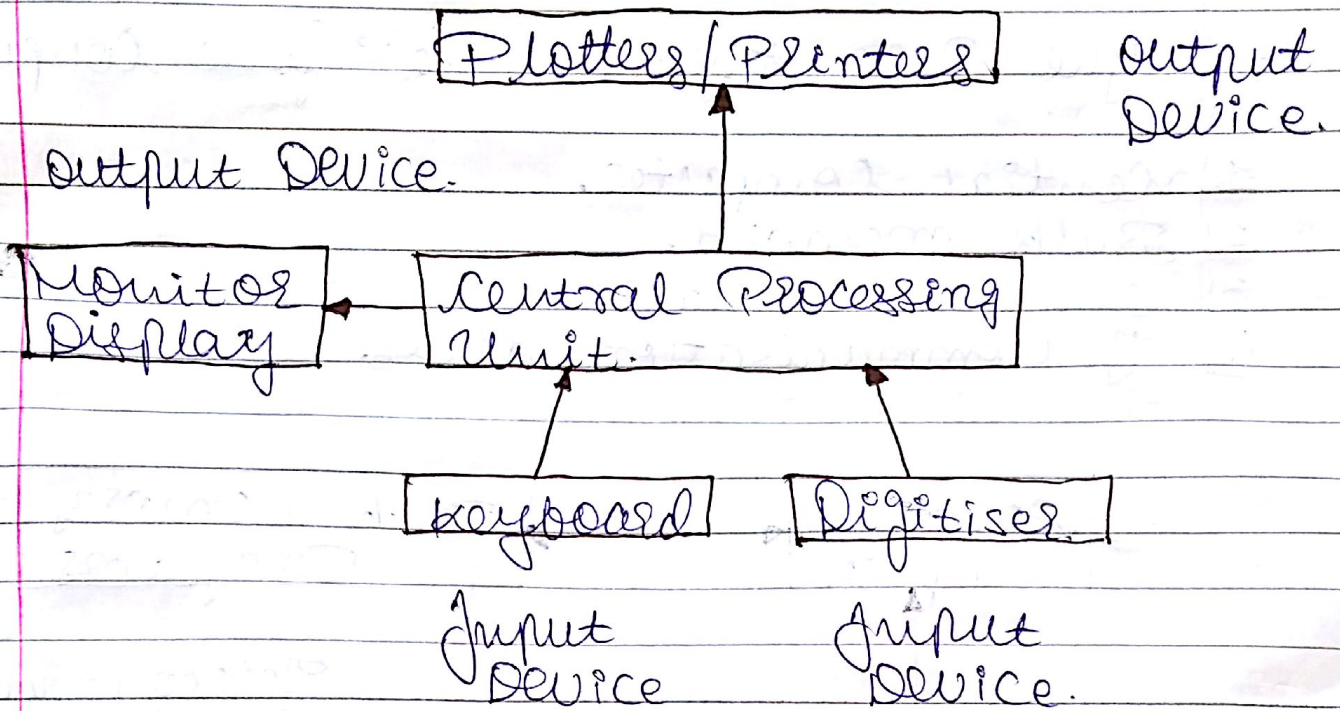
fig(A):- CAM Workstation:-

- fig (A) shows Schematic block diagram of CAM Workstation.
- The workstation has high hard disk storage capacity because work-stations have to handle lot of drawings required for manufacturing
- The digitizes is an input device that can convert the manual drawings to computer drawings or can create computer drawings from actual 3D models/parts.
- The plotters are special one which can accomodate sheets of different sizes.

✱ Difference between NC & CNC M/C Tools:-

Sr. No.	NC M/C Tools	CNC M/C Tools.
1]	NC M/C Tool does not require Computer	1] CNC m/c tool require Computer.
2]	In NC M/C tool, part program is entered on the program tape, which is read by the tape reader. The tape reader gives input to controller.	2] In CNC M/C tool, the program is entered & stored in computer memory which gives input to controller.
3]	In NC m/c tool, each part program require seperate program tape.	3] In CNC m/c tool, large number of part programs can be stored in computer
4]	In NC m/c tool, each part modifying the program is difficult.	4] In CNC m/c tool, modifying the program is easy.

Q.5] State Adv., limitations & applications of CNC M/C.

Ans] ✱ Advantages of CNC M/C Tools:-

→ Some of the advantages of CNC m/c tools are briefly discussed below:-

1] Reduced dead Time:-

— The time between the receipt of a design drawing by the production engineer and manufacturer getting ready to start the

production on the shop floor, including the time needed for planning, design & manufacture of jigs, etc is called "Lead time".

2] Elimination of Operator Errors :-

- The machine is controlled by programme of instructions stored in the memory of the computer.
- The programme is checked before it goes to the machine, so no errors will occur in the job.

3] Lower Labour Cost :-

- The proportion of cutting time in CNC M/c is more than conventional machines since the time settings, etc in CNC M/c is lower.

4] Longer Tool Life :-

- Tools can be used at optimum speeds & feeds because these functions are controlled by the part programme.

5] Reduced Inspection :-

- The time spent on inspection & in waiting for inspection to begin is greatly reduced.
- Normally, it is necessary to inspect the first component only.
- If there is any difference in the dimensions of the machined component, the programme is checked & corrected, if needed.

6] Less Scrap :-

- Since the operator errors are eliminated, a proven part programme results in an accurate component.

7] Accurate Costing & Scheduling :-

- In CNC machines, the time taken in machining is predictable, consistent and results in a greater accuracy in estimating and more consisting in costing.
- consistent operation enables the accurate compilation of shop loading schedules and thus results in a balanced loading and a more predictable output.

* Limitations of CNC Machine Tools :-

- Higher investment cost.
- Higher Maintainance cost
- Costlier CNC Personnel. [↑ Skill level].
- Planned support facility.
- Higher operating cost.

* Applications of CNC Machine Tools :-

1) CNC Turning centre.

2) CNC Machining centre.

3) CNC Welding & cutting machine.

4) CNC Laser cutting Machine.

5) CNC Wire-Cut EDM [Electrical Discharge Machining] centre.

6) CNC Die-casting Machine.

7) CNC Disc Grinder.

8) CNC Gear Shaper.

Q6] *, Explain Selection criteria or Technical Specification of CNC Machine :-

Ans]

1]	Capacity.		
2]	Chuck Size.	mm	100
3]	Max. turning diameter.	mm	32
4]	Max. turning length.	mm	120
5]	Bed.	type	45° Slant bed.
6]	No. of axes.	no	2
7]	Swing over way covers.	mm	150
8]	Swing over crosslide.	mm	50
9]	Accuracy.		
10]	Positioning accuracy.	mm	0.015.
11]	Repeatability.	mm	± 0.008.
12]	Spindle.		
13]	Spindle nose taper.		A2-3/MT 3.
14]	Bore through Spindle.	mm	20
15]	Programmable Spindle Speed.	rpm	150-3000.
16]	Spindle motor.	hp	1 hp AC induction.
17]	Programmable feed Rate.	mm/min	0-1000.
18]	CNC Detail.		
19]	Control System.		PC based 2 Axis Cont. Path
20]	Turret.		
21]	Tool Cross Section.		12 x 12.
22]	No. of Station.	no	8.
23]	Boring bar Size (capacity)	mm	16.
24]	Axes.		
25]	X-Axis travel.	mm	80.

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26]	z-axis Travel.	mm	180.
27]	Rapid feed rate.	mm/min	5000.
28]	Dist. bet'n centres.	mm	210.
29]	Axis motor.		Stepper.
30]	Slides.		Hardened grand guide ways.
31]	Tailstock.		
32]	Tailstock base travel.	mm	150.
33]	Tailstock Quill Stroke.	mm	40.
34]	Quill diameter.	mm	26.
35]	Tailstock Taper.		MT2.
36]	Coolant/Lubrication.		
37]	capacity.	Ltrs.	Not applicable.
38]	coolant motor.	kw.	Not applicable.
39]	Lubrication.		centralised system.
40]	Power source.		
41]	Main Supply.		230V, Single Ph, 50 Hz.
42]	Stabilizer.		1 Phase servo type.
43]	Machine dimensions.		
44]	L x W x H.	mm	880 x 575 x 615.
45]	Weight. [Approx.]	Kgs.	150.
46]	Optional Accessories.		
47]	Auto door, Pnuematic Chuck, Stabilizer.		
48]	features.		
49]	Compatibility/upgradable.		FMS/CIM system.

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