USE OF CAD/CAM SOFTWARE, COMPUTER INTEGRATED MANUFACTURING

Modern manufacturing facilities use a computer for a variety of manufacturing, monitoring and control functions.

Computer integrated manufacturing (CIM) can be defined as "the integration of computer based monitoring and control of all aspects of the manufacturing process, drawing on a common data base and communicating via some form of computer network.

CIM includes not only manufacturing functions (CAM), but also engineering functions (CAD) and business functions.

The main activities under CIM are:

1. Computer-Aided Design (CAD)
2. Computer-Aided Manufacturing (CAM)
3. Interfacing of CAD and CAM (CAD/CAM)
4. Computer-Aided Production Management (CAPM)

COMPUTER-AIDED DESIGN (CAD)

CAD can be simply defined as using a computer in the design process. CAD can be defined as the use of computer systems to assist in the development, analysis, modification, and optimization of an engineering design. It also includes storing and communication of design information.

It is the use of Interactive Computer Graphics (ICG) programmes to develop assemblies, parts lists, computer models and mathematical results. The output includes the working engineering drawings. It helps in getting the analytical results very quickly. This will enable the designer to evaluate more than one design alternatives which would otherwise not be possible. Also optimum design solutions can be obtained by using sophisticated programmes. This will result in significant savings in unit costs. In CAD, the total design work is divided between the designer and the computer for which each is best suited.

CAD is now used in Aerospace, Ship design, Chemical engineering, Nuclear engineering, mechanical engineering and structural engineering etc.

The components of a CAD system

1. **Hardware:** It consists of the computer and the Input-Output (I/O) devices. Input devices are generally used to transfer information from a human or storage medium to the computer. A keyboard is the standard input device used to transmit alpha numeric data to the system. The standard output for CAD is a CRT (Cathode Ray Tube) that is, the monitor. The other output devices can be printer, plotter, video tape, Computer output microfilm etc. In many cases, the design may never be produced on paper. The data generated by a CAD system can be directly utilized by a Cam system.

2. **Operating system software:** It is the interface between the CAD application software and the hardware.

3. **Application software:** It is the heart of a CAD system. It consists of programmes that do 2-D, 2.5-D, or 3-D geometric modeling, engineering analysis and drafting.

In CAD, drawings can be stored and recalled easily. Storage space needed is less. By means of a coding system, similar part designs can be grouped into classes and the similarities related. CAD is also used in simulation. The principle behind simulation is that it is cheaper, faster and easier to explore the behavior of products and systems before they are made or used, through simulation in a CAD system. A variety of software techniques and mathematical models are used for this purpose. By finite element analysis and simulation techniques, the final product design can be progressively improved.

COMPUTER-AIDED MANUFACTURING (CAM)

CAM can be simply defined as the application of computers in manufacturing. CAM refers to the use of computers in the control of production machines and ancilliary operations, for process optimization and control, process planning, process management, materials management, material movement (including transfer lines, robots, etc.), production scheduling and monitoring etc.

Process planning: Process selection, process design, process parameters, group technology, NC parts programming, tool and fixture design, quality control.

Process R &D: Process choice, optimization, modeling

Processing: Manufacturing of parts; sensing and corrective action; storing, moving and handling of materials, parts, tooling, jigs and fixtures; and assembly.

Production Planning and Control: Routing, scheduling, follow-up (tracking), machine load monitoring, inventory (parts, materials, in-process), purchasing, receiving, maintenance, quality assurance (standards, inspection, etc). Thus, CAM centres around four main areas: NC, process planning, robotics and factory management.

REVIEW QUESTIONS

1. Define CIM
2. List the activities performed by a CAD system
3. List the functions performed by a CAM system
4. Define CAM
5. State the benefits of a CAD system