JEPPIAAR ENGINEERING COLLEGE

Jeppiaar Nagar, Rajiv Gandhi Salai – 600 119

DEPARTMENT OF

MECHANICAL ENGINEERING

QUESTION BANK

V SEMESTER

ME6501 COMPUTER AIDED DESIGNING

Regulation – 2013

JEPPIAAR ENGINEERING COLLEGE

Vision of Institution

To build Jeppiaar Engineering College as an institution of academic excellence in technological and management education to become a world class university.

Mission of Institution

- To excel in teaching and learning, research and innovation by promoting the principles of scientific analysis and creative thinking.
- To participate in the production, development and dissemination of knowledge and interact with national and international communities.
- To equip students with values, ethics and life skills needed to enrich their lives and enable them to meaningfully contribute to the progress of society.
- To prepare students for higher studies and lifelong learning, enrich them with the practical and entrepreneurial skills necessary to excel as future professionals and contribute to Nation's economy.

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

JEPPIAAR ENGINEERING COLLEGE

DEPARTMENT OF MECHANICAL ENGINEERING

Vision of the Department

To create excellent professionals in the field of Mechanical Engineering and to uplift the quality of technical education on par with the International Standards.

Department Mission

1. **To reinforce** the fundamentals of Science and Mathematics to Mechanical Engineering **and critically and relatively investigate co**mplex mechanical systems and processes.
2. To engage in the **production, expansion and practice** of advanced engineering applications through knowledge sharing activities by interacting with global communities and industries.
3. To**equip** students with **engineering ethics, professional roles, corporate social responsibility** and life skills and **apply** them for the betterment of society.
4. **To promote** higher studies and lifelong learning and entrepreneurial skills and **develop** excellent professionals for empowering nation's economy.

PEO's

1. To **enrich** the technical knowledge of design, manufacturing and management of mechanical systems and **develop creative and analytical thinking** in research.
2. To **relate, strengthen and develop** the theoretical knowledge of the Mechanical Engineering by exhibiting various concepts applied through diverse industrial exposures and experts' guidance.
3. **Facilitate** the students to communicate effectively on complex social, professional and engineering activities with strict adherence to ethical principles.
4. **Create awareness for independent and life long learning and develop the ability to keep abreast of modern trends and adopt them for personal technological growth of the nation.**

PSO's

1. To understand the basic concept of various mechanical engineering field such as design, manufacturing, thermal and industrial engineering.
2. To apply the knowledge in advanced mechanical system and processes by using design and analysis techniques.
3. To develop student's professional skills to meet the industry requirements and entrepreneurial skills for improving nation's economy stronger.

ME6501 COMPUTER AIDED DESIGNING
COURSE OUTCOMES

CO No	Course Outcome
C301.1	Outline the product cycle and geometric transformation.
C301.2	Create the modelling of one dimensional,two dimensional and three-dimensional geometries.
C301.3	Apply the techniques involved in hidden line, surface and solid removal algorithms,colouring and animation.
C301.4	Ability to explain the assembly techniques and mechanism simulation.
C301.5	Ability to explain data exchange standards, communication standards and computer graphics standards.

ME6501 **COMPUTERAIDED DESIGN** **L T P C**
3 0 0 3

OBJECTIVES:

- Toprovideanoverview ofhowcomputersarebeingused inmechanical component design

UNITI FUNDAMENTALS OFCOMPUTER GRAPHICS **9**

Productcycle-Designprocess-sequentialandconcurrentengineering-Computeraideddesign– CAD system architecture -Computer graphics– co-ordinate systems-2Dand3D transformations-homogeneouscoordinates- Linedrawing -Clipping-viewingtransformation

UNITII GEOMETRIC MODELING **9**

Representationofcurves-Hermitecurve-Beziercurve-B-splinecurves-rationalcurves-Techniques forsurface modeling–surfacepatch-Coonsand bicubicpatches-BezierandB-splinesurfaces.Solid modeling techniques-CSGandB-rep

UNITIII VISUALREALISM **9**

Hidden–Line-Surface-Solid removal algorithms–shading–colouring–computeranimation.

UNITIV ASSEMBLY OFPARTS **9**

Assembly modelling– interferences ofpositionsandorientation– toleranceanalysis-massproperty calculations–mechanismsimulationand interferencechecking.

UNITV CAD STANDARDS **9**

Standards forcomputergraphics-**GraphicalKernelSystem**(GKS)-standardsforexchangeimages-**OpenG**raphicsLibrary **(OpenGL)**-Data exchangestandards- IGES,STEP,CALSetc.-communicationstandards.

TOTAL:45PERIODS

OUTCOMES:

- Uponcompletionofthiscourse, thestudentscanable tousecomputerandCAD software'sfor modelingofmechanicalcomponents

TEXT BOOKS:

1. Ibrahim Zeid“Mastering CAD CAM” TataMcGraw-Hill PublishingCo.2007

REFERENCES:

1. Chris McMahon and Jimmie Browne “CAD/CAMPrinciples", "Practice and Manufacturing management “SecondEdition,PearsonEducation,1999.
2. WilliamMNeumannandRobertF.Sproul“PrinciplesofComputerGraphics”,McGrawHill BookCo.Singapore, 1989.
3. DonaldHearnandM.PaulineBaker “Computer Graphics”’. PrenticeHall, Inc,1992.
4. Foley,WanDam,FeinerandHughes-"Computergraphicsprinciples&practice"Pearson Education- 2003.

JEPPIAAR ENGINEERING COLLEGE

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DEPARTMENT OFMECHANICAL ENGINEERING

QUESTION BANK

Subject : ME6501 & COMPUTER AIDED DESIGNING

Sem : V

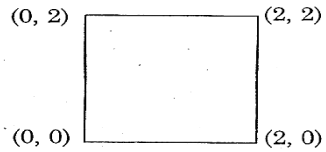
UNIT I FUNDAMENTALS OF COMPUTER GRAPHICS

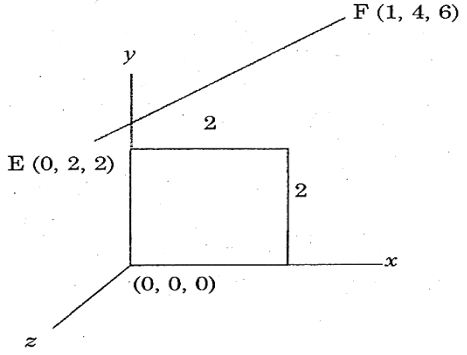
Productcycle-Designprocess-sequentialandconcurrentengineering-Computeraideddesign– CADsystemarchitecture-Computer graphics– co-ordinate systems-2Dand3D transformations-homogeneouscoordinates- Linedrawing -Clipping-viewingtransformation

PART-A

CO Mapping :C301.1

Q.No.	Questions	BT Level	Competence	PO
1	Mention any four applications of computer aided design in mechanical engineering	**BTL-1**	Remembering	**PO1**
2	List the types of 2D geometric transformations	**BTL-1**	Remembering	**PO2**
3	List the various stages in the life cycle of a product	**BTL-1**	Remembering	**PO5**
4	What is the design process? Mention the steps involved in Shirley's model tier for the design process?	**BTL-1**	Remembering	**PO5**
5	Define Product cycle.	**BTL-1**	Remembering	**PO5**
6	What is conceptualization in design process?	**BTL-1**	Remembering	**PO4**
7	Differentiate preliminary design and detailed design.	**BTL-4**	Analyzing	**PO5**
8	What are the advantages of concurrent engineering?	**BTL-1**	Remembering	**PO1**
9	Define concurrent engineering.	**BTL-1**	Remembering	**PO1**
10	Describe Computer Aided Design.	**BTL-1**	Remembering	**PO1**
11	State the importance of Computer Architecture in CAD.	**BTL-1**	Remembering	**PO1**
12	What are the steps involved in architecture implementation?	**BTL-1**	Remembering	**PO2**
13	What is `Rendering'?	**BTL-1**	Remembering	**PO2**
14	What do you understand by the term 'Texture Mapping'?	**BTL-1**	Remembering	**PO1**

15	What in 'Anti-aliasing'?	**BTL-1**	Remembering	**PO1**
16	Differentiate clockwise and counter clockwise rotation matrix.	**BTL-4**	Analyzing	**PO1**
17	What is CAD?	**BTL-1**	Remembering	**PO1**
18	Mention the various processes involved in CAD?	**BTL-1**	Remembering	**PO1**
19	How you define the term CAM?	**BTL-1**	Remembering	**PO1**
20	What are the elements of CAM?	**BTL-1**	Remembering	**PO1**
21	List down the processes involved in product cycle?	**BTL-1**	Remembering	**PO1, PO12**
22	Write down the steps involved in shighely model?	**BTL-1**	Remembering	**PO1**
23	Mention the different phases in pahl and beitz model?	**BTL-1**	Remembering	**PO1**
24	What is meant by morphology design?	**BTL-1**	Remembering	**PO1**
25	What is the advantage of sequential product development?	**BTL-1**	Remembering	**PO1**
26	Define concurrent engineering.	**BTL-1**	Remembering	**PO1**
27	Classify geometric modeling.	**BTL-4**	Analyzing	**PO1**
28	How are design related tasks grouped into functional areas?	**BTL-1**	Remembering	**PO1**
29	List down the types of computer graphics.	**BTL-1**	Remembering	**PO1**
30	Define modeling.	**BTL-1**	Remembering	**PO1**
31	What is called viewing?	**BTL-1**	Remembering	**PO1**
PART-B&PART-C				
1	(i) Rotate the rectangle (0, 0), (2, 0), (2, 2), (0, 2) shown in Fig. 1, 30° counter clockwise about its centroid and find the new coordinates of the rectangle.  (ii) Given the triangle, described by the homogeneous points matrix below, scale it by a factor 3/4, keeping the centroid in the same location. Use (1) separate matrix operation and (2) condensed matrix for transformation.	**BTL-1** **BTL-5**	Remembering Evaluating	**PO2, PO12**

	$[P] = \begin{pmatrix} 2 & 2 & 0 & 1 \\ 2 & 5 & 0 & 1 \\ 5 & 5 & 0 & 1 \end{pmatrix}$			
2	1. (i) Write short notes on concurrent engineering. 2. (ii) Rotate the rectangle shown in Fig, 30° counter clockwise about the line EF and find the new coordinates of the rectangle. 	**BTL-2BTL-1**	Understanding Remembering	**PO2, PO3,PO12**
3	Write short notes on (i) Design process (ii) CAD system architecture	**BTL-2**	Understanding	**PO2,PO12**
4	What is meant by concurrent engineering? Describe the various schemes for concurrent engineering	**BTL-1BTL-2**	Remembering Understanding	**PO1,PO12**
5	Write down 3D homogenous transformation matrices. Explain its application with suitable examples.	**BTL-2**	Understanding	**PO1, PO12**
6	What is meant by Interactive Computer Graphics? Explain its various elements.	**BTL-1 BTL-2**	Remembering Understanding	**PO1, PO12**

UNITIIGEOMETRIC MODELING				
Representationofcurves-Hermitecurve-Beziercurve-B-splinecurves-rationalcurves-Techniques forsurface modeling–surfacepatch-Coonsand bicubicpatches-BezierandB-splinesurfaces.Solid modeling techniques-CSGandB-rep				
PART-A				
CO Mapping : C301.2				
Q.No.	**Questions**	**BT Level**	**Competence**	**PO**
1	Differentiate between analytical curves, interpolated curves and approximated curves.	**BTL-4**	Analyzing	**PO1**
2	What are the limitations of Hermit curves?	**BTL-1**	Remembering	**PO1,PO12**
3	What are the advantages and disadvantages of wireframe modeling?	**BTL-1**	Remembering	**PO1**
4	Write down the eccentricity value for ellipse,	**BTL-1**	Remembering	**PO1, PO3**

	parabola and hyperbola.			
5	Define Conic section.	**BTL-1**	Remembering	**PO1**
6	Define `focus' of a curve.	**BTL-1**	Remembering	**PO1**
7	Write a short note `Hermite curve'.	**BTL-1**	Remembering	**PO1**
8	Define Quadratic Bezier curve.	**BTL-1**	Remembering	**PO1**
9	List out the various Bezier curves based on control points.	**BTL-1**	Remembering	**PO1**
10	Describe Rational Bezier curve.	**BTL-1**	Remembering	**PO1**
11	Define NURBS.	**BTL-1**	Remembering	**PO1**
12	Write down ‘Free form surface'?	**BTL-1**	Remembering	**PO1**
13	Write down the advantages and limitations of surface modeling.	**BTL-1**	Remembering	**PO1**
14	Describe the ‘Surface patch’.	**BTL-1**	Remembering	**PO1,PO12**
15	Write down ‘Bernstein’ polynomial.	**BTL-1**	Remembering	**PO1**
16	List out properties of B-Spline.	**BTL-1**	Remembering	**PO1**
17	Write down two important solid modeling techniques.	**BTL-1**	Remembering	**PO1**
18	What is CSG?	**BTL-1**	Remembering	**PO1**
19	Define curve.	**BTL-1**	Remembering	**PO1**
20	What is free -form curve?	**BTL-1**	Remembering	**PO1**
21	what are three main ways to describe curves mathematically?	**BTL-1**	Remembering	**PO1,PO12**
22	When will be synthetic curves necessary in computer graphics?	**BTL-1**	Remembering	**PO1**
23	What are types of curve continuities?	**BTL-1**	Remembering	**PO1,PO12**
24	State the two approaches to model synthetic curves.	**BTL-1**	Remembering	**PO1**
25	What is meant by cubic polynomial?	**BTL-1**	Remembering	**PO1,PO12**
26	What are called control points?	**BTL-1**	Remembering	**PO1,PO12**
27	Mention the B-spline functions properties.	**BTL-1**	**Remembering**	**PO1**

28	What is called uniform B spline?	**BTL-1**	**Remembering**	**PO2**
29	Define open uniform B spine?	**BTL-1**	**Remembering**	**PO2**
30	What do you meant by rational and non-rational curves?	**BTL-1**	**Remembering**	**PO3**
31	What are the various types of surfaces?	**BTL-1**	**Remembering**	**PO3**
32	List down the common surface entitles used in a surface modeling.	**BTL-1**	**Remembering**	**PO1**
33	What is called plane surface?	**BTL-1**	**Remembering**	**PO1**
Q.No.	**Questions**	**BT Level**	**Competence**	**PO**
PART-B&PART-C				
1	Briefly explain the different schemes used to generate a solid model	**BTL-2**	Understanding	**PO1,PO2, PO12**
2	Write short notes on approximated synthetic curves.	**BTL-2**	Understanding	**PO1, PO12**
3	What are Bezier curves? Discuss its important properties.	**BTL-1**	Remembering	**PO1, PO12**
4	What do you understand by boundary representation (B-rep) technique of solid modelling? Explain briefly the data structure of B-rep solid model.	**BTL-1BTL-2**	Remembering Understanding	**PO2, PO12**
5	Explain the various surface entities used in surface modeling. Discuss the techniques involved in surface modeling.	**BTL-1BTL-2**	Remembering Understanding	**PO1, PO12**
6	Explain how the curves are represented in Generic form.	**BTL-2**	Understanding	**PO1, PO12**
UNITIII VISUALREALISM				
Hidden–Line-Surface-Solid removal algorithms–shading–colouring–computeranimation.				
PART-A				
CO Mapping : C301.3				
Q.No.	**Questions**	**BT Level**	**Competence**	**PO**
1	Define interpolative shading and list the two methods used for interpolative shading.	**BTL-1**	Remembering	**PO1**
2	What is meant by 'visible surface determination' in 3D computer graphics?	**BTL-1**	Remembering	**PO2**
3	What are the improvements brought by Guard shading compared with other shading techniques?	**BTL-1**	Remembering	**PO1**
4	Mention the importance of coloring of three	**BTL-1**	Remembering	**PO1,PO12**

	dimensional objects in computer graphics.			
5	Classify the Visualization.	**BTL-1**	Remembering	**PO1**
6	What is the need of visualization?	**BTL-1**	Remembering	**PO1**
7	List out the various visualization approaches.	**BTL-1**	Remembering	**PO1**
8	What is hidden line removal?	**BTL-1**	Remembering	**PO1**
9	Mention any two surface removal algorithm.	**BTL-1**	Remembering	**PO1**
10	What are the advantages and limitations of Painter's algorithm?	**BTL-1**	Remembering	**PO1**
11	What is hidden solid removal?	**BTL-1**	Remembering	**PO1**
12	Mention the advantages and limitations of ray tracking algorithm.	**BTL-1**	Remembering	**PO1**
13	What is powder shading?	**BTL-1**	Remembering	**PO1**
14	Differentiate flat shading and smooth shading.	**BTL-4**	Analyzing	**PO2**
15	Define visualization?	**BTL-1**	Remembering	**PO1**
16	Name two popular forms of visualization methods.	**BTL-1**	Remembering	**PO1**
17	Mention the first step in visual realism.	**BTL-1**	Remembering	**PO1,PO2**
18	List down the approaches to achieve the visual realism.	**BTL-1**	Remembering	**PO1,PO12**
19	State the hidden line elimination mechanism in visual realism?	**BTL-1**	Remembering	**PO1**
20	What are the types of hidden line removed methods?	**BTL-1**	Remembering	**PO1,PO12**
21	List down viability tests used in hidden line elimination.	**BTL-1**	Remembering	**PO1,PO12**
22	What is meant by silhouette?	**BTL-1**	Remembering	**PO1**
23	Mention the various hidden line removal algorithms.	**BTL-1**	Remembering	**PO1**
24	List the various types of image space algorithms?	**BTL-1**	Remembering	**PO1**
25	Name the buffers used in depth buffer algorithms.	**BTL-1**	Remembering	**PO1**
26	Define area subdivision	**BTL-1**	Remembering	**PO1**

Q.No.	Questions	BT Level	Competence	PO
27	Define hidden line removal?	**BTL-1**	Remembering	**PO1,PO12**
28	What is meant by ray tracing?	**BTL-1**	Remembering	**PO1,PO12**
29	Define the term shading?	**BTL-1**	Remembering	**PO1,PO12**
30	Mention the light source used in shading.	**BTL-1**	Remembering	**PO1**
31	What are perfect or ideal reflectors?	**BTL-1**	Remembering	**PO1,PO12**
	PART-B & PART-C			
Q.No.	**Questions**	**BT Level**	**Competence**	**PO**
1	Explain the different types of hidden line algorithms.	**BTL-2**	Understanding	**PO1, PO12**
2	Briefly explain the user driven, procedural and data-driven animation techniques.	**BTL-2**	Understanding	**PO1, PO12**
3	Explain the following color models used in computer graphics: i. RGB ii. CMY	**BTL-2**	Understanding	**PO2, PO12**
4	Write short notes on the following hidden surface algorithms (i) Back-face removal (ii) Z-buffer algorithm	**BTL-2**	Understanding	**PO1, PO12**
5	Brief about i) Warncock's algorithm ii) Scan-line algorithm iii) Explain Ray-Tracing algorithm.	**BTL-2**	Understanding	**PO1, PO12**
6	Brief about Shading algorithms and enhancements	**BTL-2**	Understanding	**PO1,PO13,PO12**

UNITIV ASSEMBLY OFPARTS				
Assembly modelling– interferences ofpositionsandorientation– toleranceanalysis-massproperty calculations– mechanismsimulationand interferencechecking.				
PART-A				
CO Mapping : C301.4				
Q.No.	**Questions**	**BT Level**	**Competence**	**PO**
1	Mention the importance of geometric tolerance.	**BTL-1**	Remembering	**PO1**
2	Define the following terms: (a) Interference fit (b)	**BTL-1**	Remembering	**PO1**

	Running and sliding fit.			
3	What is meant by assembly modeling?	**BTL-1**	Remembering	**PO1**
4	What are the uses of tolerance stack-ups?	**BTL-2**	Understanding	**PO1**
5	List out techniques of assembly modeling.	**BTL-1**	Remembering	**PO1**
6	Define Bottom-up assembly design.	**BTL-1**	Remembering	**PO1**
7	Write down Top-down assembly design.	**BTL-1**	Remembering	**PO1**
8	What is mating conditions?	**BTL-1**	Remembering	**PO1**
9	Describe parent — child relationship in assembly design.	**BTL-1**	Remembering	**PO1**
10	Define Interference free matrix.	**BTL-1**	Remembering	**PO1**
11	List out the advantages of Tolerance Analysis	**BTL-1**	Remembering	**PO1**
12	What is the necessary of locating Center of gravity	**BTL-1**	Remembering	**PO, PO12**
13	Define tolerance stack-up	**BTL-2**	Understanding	**PO1, PO12**
14	Tolerance Analysis	**BTL-4**	Analyzing	**PO1, PO12**
15	Define assembly modeling	**BTL-1**	Remembering	**PO1, PO12**
16	List down the assembly modeling approach?	**BTL-1**	Remembering	**PO1, PO12**
17	How do you define mating conditions often used in assembly modeling?	**BTL-1**	Remembering	**PO1, PO12**
18	List down the other mating condition often used in assembly modeling?	**BTL-1**	Remembering	**PO1**
19	Write down techniques in evaluation of assembly sequence.	**BTL-1**	Remembering	**PO1**
20	Define tolerance?	**BTL-1**	Remembering	**PO1**
21	Define deviation and zero line?	**BTL-1**	Remembering	**PO1**
22	Define fundamental deviation and tolerance zone?	**BTL-1**	Remembering	**PO1,PO12**
23	Define basic hole basic shaft?	**BTL-1**	Remembering	**PO1**
24	Explain hole basic system and shaft basic system?	**BTL-1**	Remembering	**PO1, PO12**
25	Why is hole basic system preferred?	**BTL-1**	Remembering	**PO1, PO12**
26	How are holes ad shafts designed?	**BTL-1**	Remembering	**PO1**

Q.No.	Questions	BT Level	Competence	PO
27	Define fit?	**BTL-1**	Remembering	**PO1**
28	What are the factors that influence the amount of tolerance to be given on a part?	**BTL-4**	Analyzing	**PO1**
29	What are the preferred numbers? What is the advantage of using them?	**BTL-1**	Remembering	**PO1**
30	Define mass?	**BTL-1**	Remembering	**PO1**

PART-B& PART-C

Q.No.	Questions	BT Level	Competence	PO
1	Briefly explain the following traditional tolerance analysis methods with examples: (i) Worst-case analysis (ii) Root sum of squares	**BTL-2**	Understanding	**PO1, PO12**
2	Write short notes on i. Mechanism simulation ii. Assembly modeling.	**BTL-2**	Understanding	**PO1**
3	Briefly explain the elements of a mechanism analysis.	**BTL-2** **BTL-6**	Understanding Creating	**PO1**
4	Write short note on: Statistical tolerance analysis.	**BTL-4** **BTL-6**	Analyzing Creating	**PO1, PO12**
5	Brief about bottom up assembly and Top down assembly with example.	**BTL-2**	Understanding	**PO1, PO3,PO12**
6	Brief about WCA, WCS, and monte carlo simulation methods for tolerance analysis.	**BTL-2**	Understanding	**PO1, PO12**

UNITV CAD STANDARDS

Standards forcomputergraphics-**GraphicalKernelSystem**(GKS)-standardsforexchangeimages-**OpenG**raphicsLibrary **(OpenGL)**-Data exchangestandards- IGES,STEP,CALSetc.- communicationstandards.
System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

PART-A

CO Mapping : C301.5

Q.No.	Questions	BT Level	Competence	PO
1	Compare the shape based and the product data based exchange standards.	**BTL-2**	Understanding	**PO1**
2	What is meant by CAD data exchange? Mention its importance.	**BTL-2**	Understanding	**PO1**

3	What is the importance of standards in CAD?	**BTL-1**	Remembering	**PO1**
4	Write any three CAD standards for exchange of modeling data.	**BTL-1**	Remembering	**PO1,PO12**
5	List out the international organizations involved to develop the graphics standards:	**BTL-1**	Remembering	**PO1,PO12**
6	List out the various standards in graphics programming	**BTL-1**	Remembering	**PO1,PO12**
7	Define Graphics Kernel System (GKS)	**BTL-1**	Remembering	**PO1,PO12**
8	Enumerate Open Graphics Library.	**BTL-1**	Remembering	**PO1,PO12**
9	Narrate IRIS GL.	**BTL-1**	Remembering	**PO1**
10	Define NAPLPS	**BTL-1**	Remembering	**PO1,PO12**
11	Define IGES	**BTL-1**	Remembering	**PO1**
12	Define DXF	**BTL-1**	Remembering	**PO1**
13	Define STEP	**BTL-1**	Remembering	**PO1**
14	Define GKS	**BTL-1**	Remembering	**PO1**
15	Define PHIGS	**BTL-1**	Remembering	**PO1**
16	List down the various elements of cad cam structure without graphics system.	**BTL-1**	Remembering	**PO1,PO12**
17	Where does the graphics system position in CAD/CAM structure?	**BTL-1**	Remembering	**PO1**
18	Define database?	**BTL-1**	Remembering	**PO1**
19	State the objective of database?	**BTL-1**	Remembering	**PO1**
20	State the information contained in shape data?	**BTL-1**	Remembering	**PO1,PO12**
21	What is called topological information?	**BTL-1**	Remembering	**PO1,PO12**
22	What are the types of graphics standards?	**BTL-1**	Remembering	**PO5**
23	Define GKS?	**BTL-1**	Remembering	**PO5**
24	What are the features of GKS?	**BTL-1**	Remembering	**PO1**
25	What is NC in graphics kernel system?	**BTL-1**	Remembering	**PO1**
26	Define workstation transformation.	**BTL-1**	Remembering	**PO1**

Q.No.	Questions	BT Level	Competence	PO
27	What is CORE system?	**BTL-1**	Remembering	**PO1**
28	List down the basic items of an object in GKS?	**BTL-1**	Remembering	**PO1**
29	Define primitives	**BTL-1**	Remembering	**PO1**
30	List down the output primitives in GKS.	**BTL-1**	Remembering	**PO1,PO12**
31	Classify input methods in GKS?	**BTL-2**	Understanding	**PO1**
PART-B& PART-C				
Q.No.	**Questions**	**BT Level**	**Competence**	**PO**
1	Explain the initial graphics exchange specification methodology.	**BTL-2**	Understanding	**PO1, PO12**
2	Write short notes on: i. OpenGL ii. Standards for computer graphics.	**BTL-2**	Understanding	**PO1, PO2 ,PO12**
3	Briefly explain any one of the known graphic standards.	**BTL-2**	Understanding	**PO2,PO12**
4	Write short note on: Drawing Exchange Format (DXF) standard.	**BTL-2**	Understanding	**PO3,PO12**
5	Describe briefly about need for CAD standards?	**BTL-2**	Understanding	**PO4, PO5**
6	Brief about how data is exchanged between two CAD systems.	**BTL-6**	Creating	**PO1,PO5,PO12**

UNIT I FUNDAMENTALS OF COMPUTER GRAPHICS

Productcycle-Designprocess-sequentialandconcurrentengineering-Computeraideddesign–CADsystemarchitecture-Computer graphics– co-ordinate systems-2Dand3D transformations-homogeneouscoordinates- Linedrawing -Clipping-viewingtransformation

PART-A

1. Mention any four applications of computer aided design in mechanical engineering. (Nov/Dec 2015)

The mechanical engineering sector is the largest user of CAD systems. Application is usually coupled with manufacturing and foaming a CAD/CAM system.The applications cover all types of manufacturing operations, such as **milling turning, wire EDM, punching**, etc.

The AEC sector is the second largest application areas of CAD systems. Applications range from single a simple building design, to large scale projects, interior design, static and dynamic analysis, etc.

The electronics engineering is the third largest application. The computer performs all IC designs. It is the complexity of the designs that imposes the usage of CAD systems

The apparel industry is also a large user.Systems for clothing are rather expensive, because they are using specialized equipment, such as large plotters, cutters for patterns, and automatic machines forcutting the fabric.

2. List the types of 2D geometric transformations. (Nov/Dec 2015)

1.translation,2.scaling, 3.rotation, 4.shearing, 5.reflection

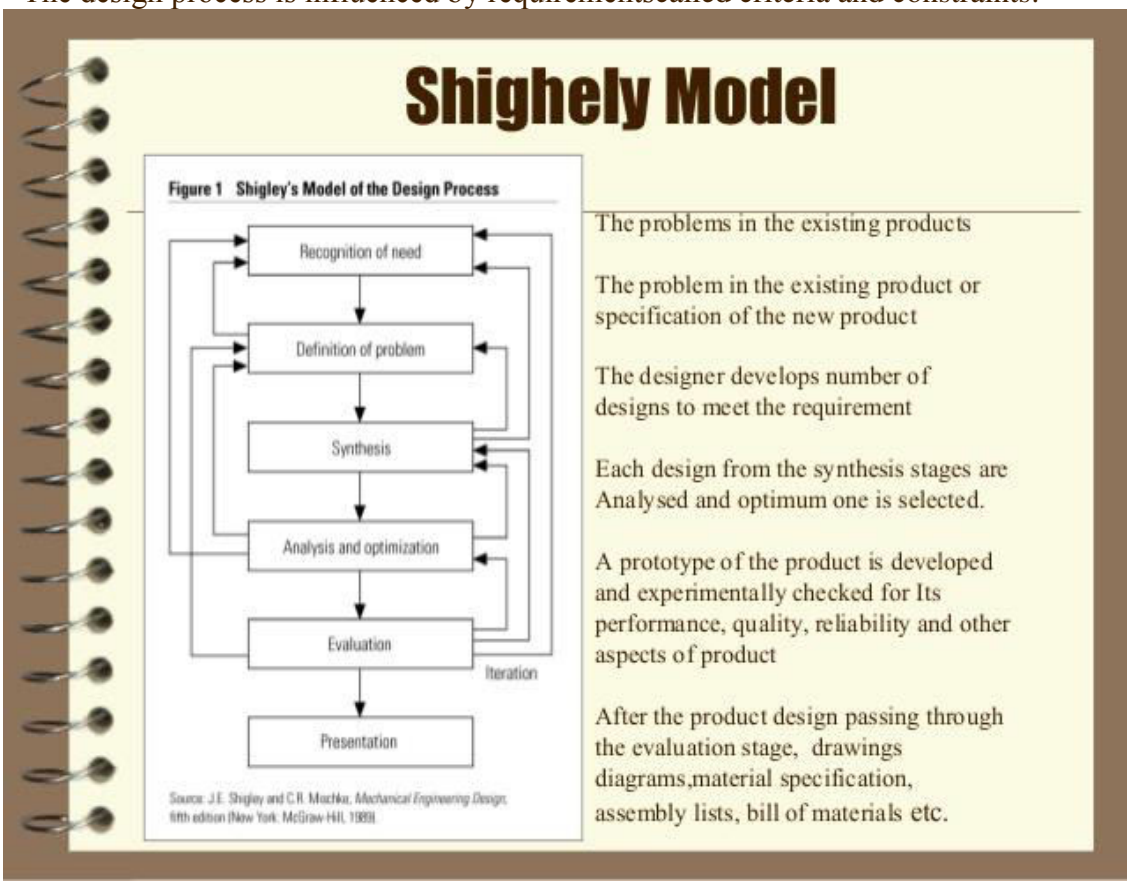
3. List the various stages in the life cycle of a product. (May/June 2016)

Phase 1: Conceive (Imagine, specify, plan, innovate)
Phase 2: Design(Describe, define, develop, test, analyze and validate)
Phase 3: Realize (Manufacture, make, build, procure, produce, sell and deliver)
Phase 4: Service(Use, operate, maintain, support, sustain, phase-out, retire, recycle and disposal)

4. What is the design process? Mention the steps involved in Shirley's model tier for the design process. (May/June 2016)

- The design process is a purposeful method of planning practical solutions to problems.

• The design process is never final; there are alwaysmultiple solutions to a problem.
• The design process is influenced by requirementscalled criteria and constraints.

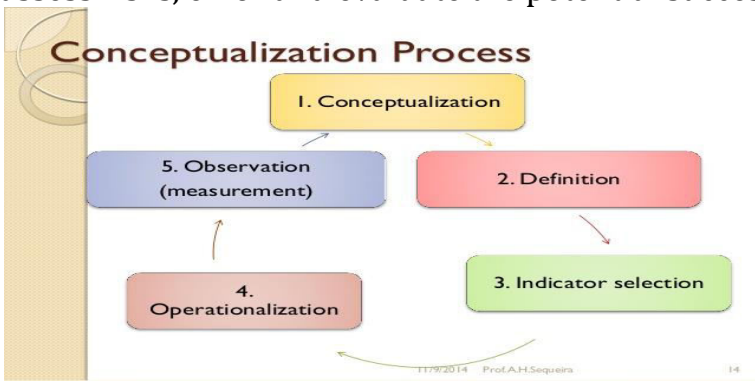


5. Define Product cycle.

Product cycle is the process of managing the entire lifecycle of a product from starting, through design and manufacture, to repair and removal of manufactured products.

6.What is conceptualization in design process?

A Concept Study is the stage of project planning that includes developing ideas and taking into account the all features of executing those ideas. This stage of a project is done to reduce the likelihood of assess risks, error and evaluate the potential success of the planned project.



7.Differentiate preliminary design and detailed design.

Preliminary design	Detailed design
The preliminary design fills the gap between the design concept and the detailed design phase. The system configuration is defined, and schematics, diagrams, and layouts of the project will offer early project configuration. In detailed design and optimization, the parameters of the part being produced will change, but the preliminary design focuses on creating the common framework to construct the project.	The next phase of preliminary design is the Detailed Design which may include of procurement also. This phase builds on the already developed preliminary design, aiming to further develop each phase of the project by total description through drawings, modeling as well as specifications.

8.What are the advantages of concurrent engineering?

a)Both product and process design run in parallel and take place in the same time.

b)Process and Product are coordinated to attain optimal matching of requirements for effective quality and delivery.

c)Decision making involves full team involvement.

9.Define concurrent engineering.

In concurrent engineering, various tasks are handled at the same time, and not essentially in the standard order. This means that info found out later in the course can be added to earlier parts, improving them, and also saving time.

Concurrent engineering is a method by which several groups within an organization work simultaneously to create new products and services.

10.Describe Computer Aided Design.

CAD is the function of computer systems to support in the creation, modification, analysis, or optimization of a design. CAD software is used to raise the productivity of the designer, progress the quality of design, progress communications through documentation, and to generate a database for manufacturing.

11.State the importance of Computer Architecture in CAD.

In CAD, Computer architecture is a set of disciplines that explains the functionality, the organization and the introduction of computer systems; that is, it describes the capabilities of a computer and its programming method in a summary way, and how the internal organization of the system is designed and executed to meet the specified facilities.

12.What are the steps involved in architecture implementation?

Computer architecture engages different aspects, including instruction set Architecture design, logic design, and implementation. The implementation includes Integrated Circuit Design, Power, and Cooling. Optimization of the design needs expertise with Compilers, Operating Systems and Packaging.

13.What is `Rendering'?

Rendering is the making of a two dimensional image from a three dimensional model by means of computer programs. A picture file has objects in a strictly defined data structure; it would have information of geometry, lighting, viewpoint, texture, and shading as a description of the scene.

Shading refers to depicting depth in three dimensional models by changing levels of darkness. It is a method used in drawing for depicting levels of darkness on document by providing media more tightly and less tightly for lighter areas.

14.What do you understand by the term 'Texture Mapping'?

Texture mapping is a system for providing detail, surface texture and color to a computer- generated graphic model. A texture map is used to the surface of a polygon. This process is like to sticking patterned paper to a plain white paper. Multi texturing is the use of more numbers of textures at a time on a polygon.

15.What in 'Anti-aliasing'?

Anti-aliasing is an advanced process for better illustration with multiple color gradations during drawing a line.

16.Differentiate clockwise and counter clockwise rotation matrix.

The direction of vector rotation is counterclockwise if θ is positive and clockwise if θ is Negative

$$R(\theta) = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$$

$$R(-\theta) = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$$

17.What is CAD?

Computer Aided Design is the technology concerned with the use of computer systems to assist the creation, modification, analysis and optimization of a design. CAD process is the subset of the design process.

18.Mention the various processes involved in CAD?

- Design engineering
- Computer graphics and
- Geometric modelling

19.How you define the term CAM?

Computer aided manufacturing is the technology concerned with the use of computer systems to plan manage and control manufacturing operations.

20.What are the elements of CAM?

- CAD
- Manufacturing
- Networking.

21.List down the processes involved in product cycle?

- Design process.
- Manufacturing process.

22.Write down the steps involved in shighely model?

- Recognition of need
- Definition of problem
- Synthesis
- Analysis and optimization
- Evaluation
- Presentation

23.Mention the different phases in pahl and beitz model?

- Classification of task
- Conceptual design
- Embodiment design
- Detail design

24.What is meant by morphology design?

Morphology design refers the study of the chronological structures of design projects.

25.What is the advantage of sequential product development?

- It is very simple well defined method and allows everyone to remain on the same page.
- It is an enforced discipline approach.

26.Define concurrent engineering.

Concurrent engineering is a methodology of restructuring the product development activity in a manufacturing organization using a cross functional team approach.

27.Classify geometric modeling.

- Wire frame modeling
- Surface modeling
- Solid modelling

28.How are design related tasks grouped into functional areas?

- Geometric modeling
- Engineering analysis
- Design review and evaluation
- Automated drafting

29.List down the types of computer graphics.

- Passive computer graphics
- Interactive computer graphics

30.Define modeling.

Modeling is the process of creating an object in the computer by using basic primitives such as points lines arc, circle, edges, areas, surfaces and volumes.

31.What is called viewing?

Viewing refers the looking of the model in various angles zooming orthographic and isometric views.

PART-B& C

1. (i) Rotate the rectangle (0, 0), (2, 0), (2, 2), (0, 2) shown in Fig. 1, 30° counter clockwise about its centroid and find the new coordinates of the rectangle. (Nov/Dec 2015)

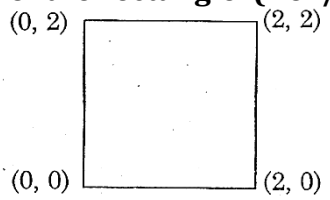


Fig. 1

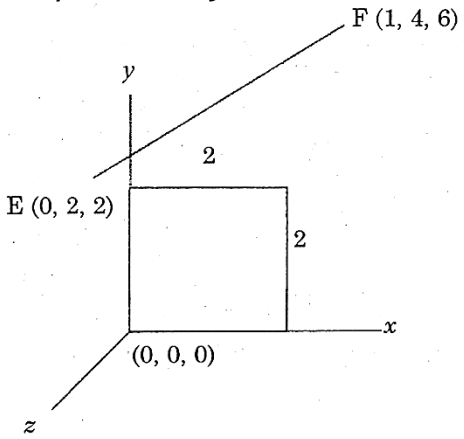
(ii) Given the triangle, described by the homogeneous points matrix below, scale it by a factor 3/4, keeping the centroid in the same location. Use (1) separate matrix operation and (2) condensed matrix for transformation. (Nov/Dec 2015)

$$[\boldsymbol{P}] = \begin{pmatrix} \mathbf{2} & \mathbf{2} & \mathbf{0} & \mathbf{1} \\ \mathbf{2} & \mathbf{5} & \mathbf{0} & \mathbf{1} \\ \mathbf{5} & \mathbf{5} & \mathbf{0} & \mathbf{1} \end{pmatrix}$$

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007, *Page No: 9*

2. (i) Write short notes on concurrent engineering. (Nov/Dec 2015)

(ii) Rotate the rectangle shown in Fig, 30° counter clockwise about the line EF and find the new coordinates of the rectangle. (Nov/Dec 2015)



*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007. *Page No from 28 to 38.*

3. Write short notes on

(iii) Design process

(iv) **CAD system architecture** **(May/June 2016)**

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007, *Page No from 46 to 51.*

4. What is meant by concurrent engineering? Describe the various schemes for concurrent engineering. **(May/June 2016)**

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007, *Page No from 51to 60.*

5Write down 3D homogenous transformation matrices. Explain its application with suitable examples.

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007, *Page No from 547 to 549.*

6. What is meant by Interactive Computer Graphics? Explain its various elements.

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007, *Page No from 98 to116.*

UNITII GEOMETRIC MODELING

Representationofcurves-Hermitecurve-Beziercurve-B-splinecurves-rationalcurves-Techniques forsurface modeling–surfacepatch-Coonsand bicubicpatches-BezierandB-splinesurfaces.Solid modeling techniques-CSGandB-rep

PART-A

1. Differentiate between analytical curves, interpolated curves and approximated curves. (Nov/Dec 2015)

Analytic Curves are points, lines, arcs and circles, fillets and chamfers, and conics (ellipses, parabolas, and hyperbolas)

interpolation - all points of the basic figure are located on the created figure called interpolation curve segment

approximation- all points of the basic figure need not be located on the created figure called approximation curve segment.

The number of specified polygon vertices fixes the order of the resulting polynomial which defines the curve. The only way to reduce the degree of the curve is to reduce the number of vertices and vice versa.

2. What are the limitations of Hermit curves? (May/June 2016)

- Hard to guess behavior between 2 defined points for arbitrary end point slopes
- Limited to 3rd degree polynomial therefore the curve is quite stiff.

3. What are the advantages and disadvantages of wireframe modeling? (May/June 2016)

Advantages of Wireframe model:

1. Simple to construct
2. Designer needs little training
3. System needs little memory
4. Take less manipulation time
5. Retrieving and editing can be done easy
6. Consumes less time
7. Best suitable for manipulations as orthographic isometric and perspective views.

Disadvantages of Wireframe model:

1. Image causes confusion
2. Cannot get required indormavtion from this model
3. Hidden line removal features not available
4. Not possible for volume and mass calculation, NC programming cross sectioning etc
5. Not suitable to represent complex solids

4. Write down the eccentricity value for ellipse, parabola and hyperbola.

The value of eccentricity less than one is ellipses; those with eccentricity equal to one are parabolas, and those with eccentricity greater than one is hyperbolas.

5. Define Conic section.

A conic section is a curve created as the intersection of a cone with a plane. In analytic geometry, a conic may be described as a plane algebraic curve of degree two, and as a quadric of dimension two.

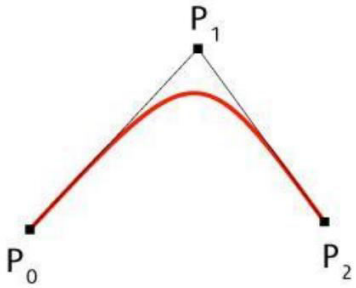
6. Define `focus' of a curve.

In geometry, the focus is pair of special points with reference to which any of a variety of curvxes is constructed.

7. Write a short note `Hermite curve'.

A Hermite curve is a spline where every piece is a third degree polynomial defined in Hermite form: that is, by its values and initial derivatives at the end points of the equivalent domain interval.

8. Define Quadratic Bezier curve.



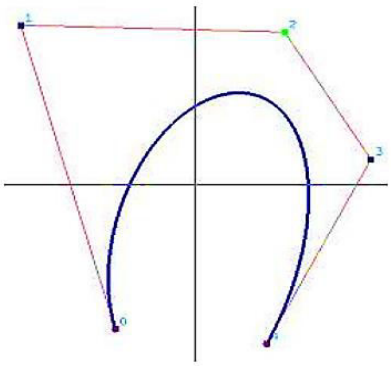
As shown in the figure, a quadratic Bezier curve is the path defined by the function B(t), given points P0, P1, and P2,

$$\mathrm{B}(t) = (1-t)[(1-t)\mathrm{P}_0 + t\mathrm{P}_1] + t[(1-t)\mathrm{P}_1 + t\mathrm{P}_2] \ , \ t \in [0,1].$$

9. List out the various Bezier curves based on control points.

Linear Bezier curve, Cubic Bezier curve and Quadratic Bezier curve

10. Describe Rational Bezier curve.



The rational Bezier curve includes variable weights (w) to provide closer approximations to arbitrary shapes. For Rational Bezier Curve, the numerator is a weighted Bernstein form Bezier and the denominator is a weighted sum of Bernstein polynomials.

11. Define NURBS.

In computer graphics, a powerful extension of B-splines is non-uniform rational B-splines is NURBS. NURBS are basically B-splines in uniform coordinates. Like B-splines, they are described by their order, and a knot vector, and a set of control points, but unlike B-splines, the control points have a weight.

12. Write down 'Free form surface'?

Freeform surface is used in CAD and other computer graphics software to describe the skin of a 3D geometric element. Freeform surfaces do not have rigid radial dimensions, unlike regular surfaces such as planes, cylinders and conic surfaces.

13. Write down the advantages and limitations of surface modeling.

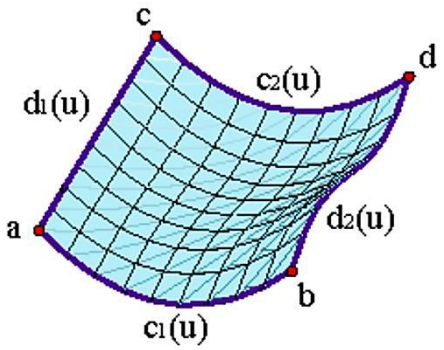
Advantages of Surface modeling:

- It is less ambiguous.
- Complex surfaces can be easily identified.
- It removes hidden line and adds realism.

Disadvantages of Surface Modeling:

- Difficult to construct.
- Difficult to calculate mass property.
- More time is required for creation.
- Requires high storage space.
- Also requires more time for manipulation.

14. Describe the 'Surface patch'.



Surface patch, which is used to create a surface using curves that form closed boundaries.

15. Write down 'Bernstein' polynomial.

The Bernstein polynomial can be described by as follows:

$$B_i^n(u) = \binom{n}{i} u^i (1-u)^{n-i}$$

16. List out properties of B-Spline.

- The sum of the B-spline basis functions for any parameter value is 1.
- Each basis function is positive or zero for all parameter values.
- Each basis function has precisely one maximum value, except for k=1.
- The maximum order of the curve is equal to the number of vertices of defining polygon.
- The degree of B-spline polynomial is independent on the number of vertices of defining polygon.
- B-spline allows the local control over the curve surface because each vertex affects the shape of a curve only over a range of parameter values where its associated basis function is nonzero.
- The curve exhibits the variation diminishing property.
- The curve generally follows the shape of defining polygon.
- Any affine transformation can be applied to the curve by applying it to the vertices of defining polygon.
- The curve line within the convex hull of its defining polygon.

17. Write down two important solid modeling techniques.

The solid modeling techniques permit for the automation of some complicated engineering calculations that are approved as a part of the design progression. Simulation, planning, and confirmation of processes such as machining and assembly were one of the initiations for the Development of solid modeling technique.

18. What is CSG?

Constructive solid geometry (CSG) is a method used in solid modeling for creating 3D models in CAD. Constructive solid geometry permits a modeler to make a complex surface by applying Boolean operators to join objects. Frequently CSG presents a model/surface that appears visually complex, but is essentially little more than cleverly combined.

19. Define curve.

Curve is a continuous map from one-dimensional space to n-dimensional space.

20. What is free -form curve?

A general curve which does not have a named shape is sometimes called a free form curve.

21. what are three main ways to describe curves mathematically?

- Explicit
- Implicit
- Parametric curves.

22. When will be synthetic curves necessary in computer graphics?

- When a curve is represented by a collection of measured data points.
- When an existing curve needs to be modified to meet new requirements of design.

23. What are types of curve continuities?

- Geometric
- Parametric

24. State the two approaches to model synthetic curves?

- Interpolation
- Approximation.

25. What is meant by cubic polynomial?

Cubic polynomials the minimum order polynomial that can guarantee the general of these curves.

26. What are called control points?

The Bezier curve is defined in terms of locations with points which are called control points.

27. Mention the B-spline functions properties.

- Partition of unity
- Positivity
- Local support
- Continuity

28. What is called uniform B spline?

When the spacing between knot values is constant, the resultant curve is called a uniform B spline.

29. Define open uniform B spine?

Open uniform b-spline curve is a cross between uniform b spline and non-uniform b splines.

30. What do you meant by rational and non-rational curves?

Rational curve is defined as the ratio of two polynomials whereas a non-rational curve is defined by one polynomial.

31. What are the various types of surfaces?

- Flat surface-most basic feature of surface model.
- Sculptured surface-based on flat face mostly used in FE analysis.
- Sculptured surface
- Analytical surfaces
- Combination of the above types.

32. List down the common surface entitles used in a surface modeling.

- Plane surface
- Ruled surface
- Surface of revolution

33. What is called plane surface?

The most elementary and simplest form of the surface types is the plane surface which may be defined between two parallel straight lines through three points or through

a line and a point.

PART-B& PART-C

1. **Briefly explain the different schemes used to generate a solid model.(Nov/Dec 2015)**

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*, Page No from62 to 65.*

2. **Write short notes on approximated synthetic curves.(Nov/Dec 2015)**

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*, Page No from 207to 208.*

3. **What are Bezier curves? Discuss its important properties. (May/June 2016)**

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*, Page No from 224 to 228.*

4. **What do you understand by boundary representation (B-rep) technique of solid modelling? Explain briefly the data structure of B-rep solid model. (May/June 2016)**

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*, Page No from 178 to 182.*

5. **Explain the various surface entities used in surface modeling. Discuss the techniques involved in surface modeling.**

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*, Page No from 209 to 211.*

6. **Explain how the curves are represented in Generic form.**

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*", Page No:226*

UNITIII VISUALREALISM

Hidden–Line-Surface-Solid removal algorithms–shading–colouring–computeranimation.

PART-A

1. Define interpolative shading and list the two methods used for interpolative shading. (Nov/Dec 2015)

The first step towards visual realism is to eliminate these ambiguities which can be obtained using hidden line removed hidden line removal hidden surface removed and hidden solid removal approaches.

2. What is meant by 'visible surface determination' in 3D computer graphics? (Nov/Dec 2015)

The hidden line eliminate can be stated as for a given three dimensional scene a given viewing point and a given direction eliminate from an appropriate two dimensional projection of the edges and faces which the observer cannot see.

3. What are the improvements brought by Guard shading compared with other shading techniques? (May/June 2016)

If the diffuse reflections from the surface are scattered with equal intensity in all directions, it is referred as perfect or ideal diffuse reflectors. They are also called lambertian reflectors.

4. Mention the importance of coloring of three dimensional objects in computer graphics. (May/June 2016)

A Concept Study is the stage of project planning that includes developing ideas and

taking into account the all features of executing those ideas. This stage of a project is done to reduce the likelihood of assess risks, error and evaluate the potential success of the planned project.

5. Classify the Visualization.

- Visualization in geometric modeling

Visualization in scientific computing.

6. What is the need of visualization?

Visualization in geometric modeling is helpful in finding connection in the design applications. By shading the parts with various shadows, colors and transparency, the designer can recognize undesired unknown interferences. In the design of complex surfaces shading with different texture characteristics can use to find any undesired quick modifications in surface changes.

7. List out the various visualization approaches.

- Parallel projections
- Perspective projection.
- Hidden line removal
- Hidden surface removal
- Hidden solid removal
- Shaded models

8. What is hidden line removal?

Hidden line removal (HLR) is the method of computing which edges are not hidden by the faces of parts for a specified view and the display of parts in the projection of a model into a 2D plane.

9. Mention any two surface removal algorithm.

- Z - buffer algorithm
- Painters algorithm

10. What are the advantages and limitations of Painter's algorithm?

Advantage of painter's algorithm is the inner loops are quite easy and limitation is sorting operation.

11. What is hidden solid removal?

The hidden solid removal problem involves the view of solid models with hidden line or surface eliminated. Available hidden line algorithm and hidden surface algorithms are useable to hidden solid elimination of B-rep models.

12. Mention the advantages and limitations of ray tracking algorithm.

Advantages of Ray tracing:

- A realistic simulation of lighting over other rendering.
- An effect such as reflections and shadows is easy and effective.

- Simple to implement yet yielding impressive visual results.

Limitation of ray tracing:

- Scan line algorithms use data consistency to divide computations between pixels, while ray tracing normally begins the process a new, treating every eye ray separately.

13. What is powder shading?

Powder shading is a sketching shading method. In this style, the stumping powder and paper stumps are used to draw a picture. This can be in color. The stumping powder is smooth and doesn't have any shiny particles. The poster created with powder shading looks more beautiful than the original. The paper to be used should have small grains on it so that the powder remains on the paper.

14. Differentiate flat shading and smooth shading.

Flat Shading	Smooth Shading
Uses the similar color for each pixel in a face - generally the color of the first vertex.	Soft shading utilizes linear interpolation of colors between vertices.
Edges show extra pronounced than they would on a real object because of a occurrence in the eye known as `lateral inhibition'.	The edges vanish with this method.
Similar color for some point of the face.	Every point of the face has its own color.
Selected faces are visualized.	Visualize fundamental surface.
Not suitable for soft objects.	Apposite for some objects.
Less computationally costly.	More computationally costly.

15. Define visualization?

Visualization can be defined as a technique for creating images diagrams for animations to communicate ideas.

16. Name two popular forms of visualization methods.

- Animation
- Simulation

17. Mention the first step in visual realism.

The first step towards visual realism is to eliminate these ambiguities which can be obtained using hidden line removed hidden line removal hidden surface removed and

hidden solid removal approaches.

18. List down the approaches to achieve the visual realism.

There are further more approaches to achieve the visual realism such as shading lighting transparency and coloring.

19. State the hidden line elimination mechanism in visual realism?

The hidden line eliminate can be stated as for a given three dimensional scene a given viewing point and a given direction eliminate from an appropriate two dimensional projection of the edges and faces which the observer cannot see.

20. What are the types of hidden line removed methods?

- Object space method and
- Image space method.

21. List down viability tests used in hidden line elimination.

- Minimax test
- Containment test
- Surface test
- Computing silhouettes
- Edge intersection

22. What is meant by silhouette?

An edge is the intersection of one visible face and one invisible face is termed as silhouettes.

23. Mention the various hidden line removal algorithms.

- Edge oriented approach
- Silhouette originated approach
- Area oriented approach

24. List the various types of image space algorithms?

- Depth buffer algorithm or buffer algorithm
- Area coherence algorithm or Warnock's algorithm
- Scan line algorithm or Warnock's algorithm
- Depth or priority algorithm

25. Name the buffers used in depth buffer algorithms.

- Depth buffer or z buffer which stores the smallest z value for each pixel
- Refresh buffer or frame buffer which stores the intensity value for each position

26. Define area subdivision

Area subdivision method is the process involving in the division of viewing window into four equal sub window or sub divisions.

27. Define hidden line removal?

Hidden line removal is the process of displaying the solid models with hidden lines or surfaces removal. This process is carried out automatically because of the completeness and unambiguities of solid models.

28. What is meant by ray tracing?

Ray tracing is the process of tracking and plotting the path taken by the rays of light starting at a light source to the centre of projection.

29. Define the term shading?

Shading is defined as the process of variation in observed chromatic or achromatic color across the object face.

30. Mention the light source used in shading.

- Light emitting sources
- Light reflecting sources

31. What are perfect or ideal reflectors?

If the diffuse reflections from the surface are scattered with equal intensity in all directions, it is referred as perfect or ideal diffuse reflectors. They are also called lambertian reflectors.

PART-B& PART-C

1. Explain the different types of hidden line algorithms. (Nov/Dec 2015)

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007.*", Page No:266 to 268 andfrom 271 to 272.*

2. Briefly explain the user driven, procedural and data-driven animation techniques. (Nov/Dec 2015)

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007.*", Page No from 95 to 97.*

Refer: "Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.", Page No:265 to 274.

3. Explain the following color models used in computer graphics:
(v) RGB
(vi) CMY (May/June 2016)

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007.*", Page No from 148 to 158.*

4. Write short notes on the following hidden surface algorithms
(i) Back-face removal
(ii) Z-buffer algorithm (May/June 2016)

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007.*", Page No from 109 to 114.*

5. **Brief about i) Warncock's algorithm ii) Scan-line algorithm iii) Explain Ray-Tracing algorithm**.

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*", Page No from 272 to273.*

6. Brief about Shading algorithms and enhancements.

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*", Page No from 321 to 323 &from 326 to328.*

UNITIV ASSEMBLY OFPARTS

Assembly modelling– interferences ofpositionsandorientation– toleranceanalysis-massproperty calculations– mechanismsimulationand interferencechecking.

PART-A

1. 1. Mention the importance of geometric tolerance. (Nov/Dec 2015)

Components can be positioned within the product assembly using absolute coordinate placement methods or by means of mating conditions. Mating conditions are definitions of the relative position of components between each other; for example alignment of axis of two holes or distance.

2. 2. Define the following terms: (a) Interference fit (b) Running and sliding fit. (Nov/Dec 2015)

In a 'top down' assembly design all parts are classically designed by the similar person within a single part. 3D assembly handles 'top down' method by allowing to design and creation of a component while work in the active part. Hence, the active part will be an assembly part.

3. What is meant by assembly modeling? (May/June 2016)

When components are additional to an assembly, parent and child relationships are created. These relationships are displayed by graphically as an assembly tree. Parts are parametrically connected by position constraints. These constraints have data about how a part should be placed within the assembly hierarchy and how it should respond if other components are edited.

4. What are the uses of tolerance stack-ups? (May/June 2016)

Tolerance stack-up computations show the collective effect of part tolerance with respect to an assembly need. The tolerances 'stacking up' would describe to adding tolerances to obtain total part tolerance, then evaluating that to the existing gap in order to see if the design will work suitably.

5. List out techniques of assembly modeling.

- Bottom-up assembly model
- Top-down assembly model

6. Define Bottom-up assembly design.

In a 'bottom up' assembly design, complex assemblies are divided into minor subassemblies and parts. Every part is considered as individual part by one or more designers. The parts can be archived in a library in one or more 3D Files. This is the high effective way to generate and manage complex assemblies.

7. Write down Top-down assembly design.

In a 'top down' assembly design all parts are classically designed by the similar person within a single part. 3D assembly handles 'top down' method by allowing to design and creation of a component while work in the active part. Hence, the active part will be an assembly part.

8. What is mating conditions?

Components can be positioned within the product assembly using absolute coordinate placement methods or by means of mating conditions. Mating conditions are definitions of the relative position of components between each other; for example alignment of axis of two holes or distance of two faces from one another.

9. Describe parent — child relationship in assembly design.

When components are additional to an assembly, parent and child relationships are created. These relationships are displayed by graphically as an assembly tree. Parts are parametrically connected by position constraints. These constraints have data about how a part should be placed within the assembly hierarchy and how it should respond if other components are edited.

10. Define Interference free matrix.

Component already in an assembled location. Assembly actions that result in interferences are denoted as '0' in the matrix, and assembly actions that do not result in interferences are denoted as '1' in the matrix.

11. List out the advantages of Tolerance Analysis

- Accurate part assembly.
- Elimination of assembly rework
- Improvement in assembly quality.
- Reduction of assembly cost.
- High customer satisfaction.
- Effectiveness of out-sourcing.

12. What is the necessary of locating Center of gravity

The necessary of center of gravity is to describe

- the 'center of mass' of the object.
- the location where the object would balance.
- the single point where the static balance moments are all zero about three mutually perpendicular axis.
- the centroid of object the volume when the object is homogeneous.
- the point where the total mass of the component could be measured to be concentrated while static calculations.
- the point about where the component rotates in free space
- the point via the gravity force can be considered to perform
- the point at which an exterior force must be used to create translation of an object in space

13. Define tolerance stack-up

Tolerance stack-up computations show the collective effect of part tolerance with respect to an assembly need. The tolerances 'stacking up' would describe to adding tolerances to obtain total part tolerance, then evaluating that to the existing gap in order to

see if the design will work suitably.

14. Tolerance Analysis

Tolerance analysis is a title to a different approaches applied in product design to know how deficiencies in parts as they are manufactured, and in assemblies, influence the ability of a product to meet customer needs.

15. Define assembly modeling

Assembly modeling is a technology and method used by cad systems to handle multiple files which represent the components within product.

16. List down the assembly modeling approach?

- Bottom up approach
- Top down approach

CombinationOrganizational barriers: Organizational policy, rules and regulations; Complexity in organizational structure; Organizational facilities; Status relationships.

17. How do you define mating conditions often used in assembly modeling?

Constrains or mating conditions refer the geometric or mathematical rules or restrictions which are applied to applied to restrict the location of parts in the assembly model.

18. List down the other mating condition often used in assembly modeling?

- Parallel
- Perpendicular
- Path mate

19. Write down techniques in evaluation of assembly sequence.

- Procedure diagram
- Liaison sequence diagram
- Procedure graph

20. Define tolerance?

Tolerance is the amount of variation permitted to a basic size. Difference between maximum and minimum limits of size is called tolerance.

21. Define deviation and zero line?

Deviation is the difference between actual size and basic size Zero line is lines that represent basic size deviation are referred to this line.

22. Define fundamental deviation and tolerance zone?

Fundamental deviation it is either the upper or lower devotion nearer to the zero line and chosen to refer the position of tolerance zone.

23. Define basic hole basic shaft?

Basic hole is a hole for which the lower deviation is zero. Low limit size, basic size Basic shaft Is a shaft for which the upper deviation is zero high limit size basic size.

24. Explain hole basic system and shaft basic system?

Hole basic system in this the hole size is kept constant and shaft size is varied to get required fit.

25. Why is hole basic system preferred?

Hole basic system is preferred because it requires less number of tool that results in less cost of manufacturing.

26. How are holes ad shafts designed?

Holes are designed by upper case English alphabets and shaft by lower case.

27. Define fit?

Fit refers to the relative tightness or looseness between two mating parts.

28. What are the factors that influence the amount of tolerance to be given on a part?

- Functional of the product
- Manufacturing process
- Cost of production

29. What are the preferred numbers? What is the advantage of using them?

Preferred numbers are number which is got by geometric progression with specific step ratios, they include integral power of 10.

30. Define mass?

Mass is the amount of matter contained in an object.

PART-B& PART-C

1.Briefly explain the following traditional tolerance analysis methods with examples:

(iii) Worst-case analysis

(iv) Root sum of squares. (Nov/Dec 2015)

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*", Page No: from 311 to 317.*

2. Write short notes on

(i) Mechanism simulation

(ii) Assembly modeling. (Nov/Dec 2015)

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*", Page No:from 460 to 472.*

3. Briefly explain the elements of a mechanism analysis. (May/June 2016)

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*", Page No from 431 to 445.*

4.**Write short note on: Statistical tolerance analysis. (May/June 2016)**

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007.*", Page No from 409 to 415.*

5.**Brief about bottom up assembly and Top down assembly with example.**

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*", Page No from 406 to 409 and from416 to 421.*

6.Brief about WCA, WCS, and monte carlo simulation methods for tolerance analysis.

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*", Page No: 374 to 380.*

UNITV CAD STANDARDS

Standards forcomputergraphics-**GraphicalKernelSystem**(GKS)-standardsforexchangeimages-**OpenG**raphicsLibrary **(OpenGL)**-Data exchangestandards- IGES,STEP,CALSetc.- communicationstandards. System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

PART-A

1. Compare the shape based and the product data based exchange standards. (Nov/Dec 2015)

OpenGL is supported on Silicon Graphics' Integrated Rater Imaging System Graphics Library (IRIS GL). Though it would have been potential to have designed a totally new Application Programmer's Interface (API), practice with IRIS GL offered insight into what programmers need and don't need in a Three Dimensional graphics API.

2. What is meant by CAD data exchange? Mention its importance. (Nov/Dec 2015)

NC is a function system for all workstations. In normalized coordinates the drawn picture image is changed to run between 0 and 1. the coordinates, the drawn picture NC is a hardware coordinates.

3. What is the importance of standards in CAD? (May/June 2016)

Shape data contains the information about both geometric and topographical information along with surface features.

4. Write any three CAD standards for exchange of modeling data. (May/June 2016)

Topological information is the information about the product through solid modeling next features include the high level concepts about parts such as hole flange web pocket chamfer.

5. List out the international organizations involved to develop the graphics standards:

- ACM (Association for Computer Machinery)
- ANSI (American National Standards Institute)
- ISO (International Standards Organization)
- GIN (German Standards Institute)
- CALS, GKS , PHIGS , VDI , VDM , NAPLPS

6. List out the various standards in graphics programming

- IGES (Initial Graphics Exchange Specification)

- DXF (Drawing / Data Exchange Format)
- STEP (Standard for the Exchange of Product model data)

7. Define Graphics Kernel System (GKS)

The Graphical Kernel System (GKS) was the first ISO standard for computer graphics in low-level, established in 1977. GKS offers a group of drawing aspects for 2D vector graphics appropriate for mapping and related duties

8. Enumerate Open Graphics Library.

OpenGL draws primitives into a structured buffer focus to a various selectable modes. Every Point, line, polygon, or bitmap are called as a primitive. Each mode can be modified separately; the parameters of one do not affect the parameters of others.

9. Narrate IRIS GL.

OpenGL is supported on Silicon Graphics' Integrated Rater Imaging System Graphics Library (IRIS GL). Though it would have been potential to have designed a totally new Application Programmer's Interface (API), practice with IRIS GL offered insight into what programmers need and don't need in a Three Dimensional graphics API

10. Define NAPLPS

NAPLPS (North American Presentation- Level Protocol Syntax) describes text and graphics in the form of sequences of bytes in ASCII code.

11. Define IGES

IGES (Initial Graphics Exchange Specification) enables an exchange of model data basis among CAD system

12. Define DXF

DXF (Drawing / Data Exchange Format) file format was meant to provide an exact representation of the data in the standard CAD file format.

13. Define STEP

STEP (Standard for the Exchange of Product model data) can be used to exchange data between CAD, Computer Aided Manufacturing (CAM), Computer Aided Engineering (CAE), product data management/enterprise data modeling (PDES) and other CAx systems.

14. Define GKS

GKS (Graphics Kernel System) provides a set of drawing features for two-dimensional vector graphics suitable for charting and similar duties.

15. Define PHIGS

PHIGS (Programmer's Hierarchical Interactive Graphic System) The PHIGS standard defines a set of functions and data structures to be used by a programmer to manipulate and display 3-D graphical objects.

16. List down the various elements of cad cam structure without graphics system.

- Applied data
- Application program
- Graphics system
- Application data input/output device

17. Where does the graphics system position in CAD/CAM structure?

It is position between application program and application data input/output device.

18. Define database?

Database is a collection of data at a single location to be used by various people for different application.

19. State the objective of database?

- It reduce or eliminate reduce data
- It integrates existing data
- It provide security
- It shares the data among users
- It incorporate the changes quickly and effectively

20. State the information contained in shape data?

Shape data contains the information about both geometric and topographical information along with surface features.

21. What is called topological information?

Topological information is the information about the product through solid modeling next features include the high level concepts about parts such as hole flange web pocket chamfer.

22. What are the types of graphics standards?

- GKS
- PHIGS
- CORE
- GKS
- IGES

23. Define GKS?

GKS is basically a set of procedures which can be called can be called by user programmers to carry out certain generated function Such as. Circle ellipse defined in term of number of levels describing the level of support in terms of facilities.

24. What are the features of GKS?

It is an independent device. So it can work ,with all types of input and output devices All text and annotation device. Graphics function are defined foe both 2D, 3D.

25. What is NC in graphics kernel system?

NC is a function system for all workstations. In normalized coordinates the drawn picture image is changed to run between 0 and 1. the coordinates, the drawn picture NC is a hardware coordinates.

26. Define workstation transformation.

- Control function
- Output function
- Output primitives
- Segment function
- Transformation
- Input transformation

27. What is CORE system?

The core system standardization of graphic system is called core system.

28. List down the basic items of an object in GKS?

- Primitives
- Attributes

29. Define primitives

In GKS pictures are considered to be constructed from a number of basic building blocks called primitives.

30. List down the output primitives in GKS.

- Polyline
- Polymakers
- Text
- Fill area

31. Classify input methods in GKS?

- String
- Choice
- Valuator
- Locator

PART-B& PART-C

1. Explain the initial graphics exchange specification methodology. (Nov/Dec 2015)

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*", Page No from 488 to 491.*

2. Write short notes on:

(i) OpenGL

(ii) Standards for computer graphics. (Nov/Dec 2015)

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*", Page No from 321 to 335.*

3. Briefly explain any one of the known graphic standards. (May/June 2016)

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*", Page No from 386 to 391.*

4. Write short note on: Drawing Exchange Format (DXF) standard. (May/June 2016)

*Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007*", Page No from 526 to 530.*
5. Describe briefly about need for CAD standards? *Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007.*", from Page No 516 to 525.*
6. Brief about how data is exchanged between two CAD systems. *Refer: "*Ibrahim Zeid"Mastering CAD CAM" TataMcGraw-Hill PublishingCo.2007.*", Page No from 497 to 498.*