



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

MECHANICAL ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	Rapid Prototyping Technologies
Course Code	:	BCC003
Class	:	M. Tech I Semester CAD/CAM
Branch	:	Mechanical
Year	:	2017 - 2018
Course Coordinator	:	Mr. M. Sunil Kumar, Assistant Professor

OBJECTIVES

Rapid prototyping is the technique to quickly fabricate a model of a physical assembly using a three dimensional computer aided design data. The process begins with taking a virtual design from modeling or CAD software. One type of Rapid Prototyping is known as 3D printing, which is an additive manufacturing technology. The process begins with taking a virtual design from modeling or CAD software. The 3D printing machine reads the data from the CAD drawing and lays down successive layers of liquid, powder, or sheet material, and builds up the physical model from a series of cross sections. These layers, which correspond to the virtual cross section from the CAD model, are automatically joined together to create the final shape.

UNIT – I			
INTRODUCTION TO RAPID PROTOTYPING			
Part - A (Short Answer Questions)			
S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1	Why rapid prototyping is important in industries.	Remember	1
2	How rapid prototyping systems are classified. Give the example for each classification.	Remember	1
3	Explain the key aspects of rapid prototype technologies.	Understand	1
4	What meant by rapid prototype. What are the roles of prototype in development process.	Understand	1
5	Explain in detail the common information work flow indicating the main stage of rapid prototyping system work flow.	Understand	1
6	Describe the steps involved in rapid process chain.	Understand	1
7	Briefly classify the rapid prototyping systems	Understand	1
8	List out the advantages of rapid prototyping process	Understand	1
9	“Establish a statement that rapid prototyping is limited to some application” Justify your statement.	Understand	1
10	Explain the limitations of rapid prototyping.	Understand	1
11	Establish a statement how rapid prototyping is used in automation.	Understand	1
12	Explain rapid prototyping. Classification of rapid prototyping system.	Understand	1
Part - B (Long Answer Questions)			
S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1	Explain the history of rapid prototyping systems and its fundamental development.	Remember	1

2	Explain the need of rapid prototyping	Remember	1
3	List out the classification of rapid prototype systems.	Remember	1
4	Explain in detail the process chain rapid prototyping.	Remember	1
5	Discuss limitations of rapid prototyping explain in detail.	Remember	1
6	Write short notes on advantages of rapid prototyping.	Remember	1
7	Classify rapid prototyping and give its basic principle.	Remember	1

Part - C (Problem Solving and Critical Thinking Questions)

S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1.	Enumerate the requirements of new product development strategies. Explain the critical factor affecting the process	Understand	1
2.	Explain the various demands on CAD system used in rapid prototyping	Remember	1
3.	Discuss the evolution of rapid prototype systems indicating the history and growth rate in industrial sector.	Understand	1
4.	What are the three phases of rapid prototyping. Contrasting these with those of geometric modelling, what similarities can be drawn	Understand	1
5.	Describe the advantages of rapid Prototyping in terms of its beneficiaries such as the product designers, tool designer, manufacturing engineer, marketers and consumers.	Understand	1
6.	Describe the steps involved in a general rapid prototyping process chain and Distinguish cleaning, post curing and finishing which are the various tasks of post processing.	Understand	1
7.	What are the three types of automated fabricators? Describe them and give two examples each.	Understand	1
8	Summarize the key aspect of rapid prototyping. Explain With an example the historical development of rapid prototype technology.	Understand	1
9	Categorize of applications in rapid prototype technology in manufacturing industries and also compare rapid prototype technology with computer numerical control technology.	Understand	1

**UNIT-II
TYPES OF PROTOTYPING SYSTEMS**

Part – A (Short Answer Questions)

S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1	Define the fundamental principle of stereo lithography process.	Understand	2
2	Explain alternating direction implicit method.	Understand	2
3	Define fused deposition modeling.	Remember	2
4	Compare solid based rapid prototyping and liquid based rapid prototyping.	Remember	2
5	Differentiate between stereo lithography and solid ground curing.	Remember	2
6	Define laminated object manufacturing and specification.	Remember	2
7	Explain the advantages of liquid based stereo lithography.	Remember	2
8	Explain merits of fused deposition modeling.	Remember	2
9	List out the application of fused deposition modeling.	Understand	2
10	Explain laminated object manufacturing and its applications.	Understand	2

Part - B (Long Answer Questions)

S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1	Compare and contrast the liquid-based stereo lithography systems and the solid ground curing systems. What are the advantages disadvantages for each of the systems.	Understand	2
2	Explain in details the working principle of solid ground curing models with its advantages and disadvantages. Differentiate SLA and SLS in	Understand	2

	rapid prototyping		
3	Explain merits and demerits of Laminated Object Manufacturing. Describe the principle of FDM with its advantages, disadvantages and applications	Understand	2
4	Explain with the help of simple line diagram explain the construction details of extrusion head in FDM process.	Understand	2
5	Describe Fused deposition modeling process with a neat sketch.	Understand	2
Part – C (Problem Solving and Critical Thinking)			
S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1	Specify and explain the different process, parameters of SLA technique, the different material which may used in manufacturing of products in SLA technique	Remember	2
2	Explain with a neat sketch, principle of operation of Selective Laser Sintering Process.	Remember	2
3	Compose the principles behind stereo litho sintering process. Briefly explain the materials used in stereo litho sintering.	Understand	2
4	Narrate Laminated Object manufacturing on principle in works, models depict merits and demerits with a neat sketch.	Remember	2
5	Explain in details the working principle of solid ground curing models with its advantages and disadvantages. Differentiate SLA and SLS in rapid prototyping.	Understand	2
6	What are features of LOM process. Describe the process flow of LOM process List practical out applications	Remember	2
7	What are the advantages and limitations of solid based system compared with liquid based system.	Understand	2
UNIT-III			
POWDER BASED RAPID PROTOTYPING AND TOOLING			
Part - A (Short Answer Questions)			
S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1	Explain the selective laser sintering. Process.	Understand	3
2	Explain the three dimensional printing.	Understand	3
3	Discuss the advantages and disadvantages of selective laser sintering.	Understand	3
4	Write the applications of 3DP.	Understand	3
5	Explain the powder based rapid prototyping.	Remember	3
6.	What is rapid tool.	Remember	3
7.	Differentiate soft tooling and hard tooling.	Understand	3
8.	What is investment casting.	Understand	3
9.	Explain vaccum casting.	Understand	3
10.	What are the applications of FDM models. Give an example.	Remember	3
11.	What is the need of rapid prototyping while conventional tooling are existing.		
Part – B (Long Answer Questions)			
S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1	Explain the critical factors that influence the performance and functions of Selective Laser Sintering and 3-Dimentional printing.	Understand	3
2	Discuss the advantages and disadvantages of powder based rapid prototyping system and compare with liquid based and solid based rapid prototyping systems	Understand	3
3	Discuss the merits and demerits of selective laser sintering process.	Understand	3

4	Discuss the principle of three dimensional printing process using a case study.	Understand	3
5	Discuss the principle of selective laser sintering process using a case study	Understand	3
6.	What is rapid tooling and explain about evaporative pattern casting process	Understand	3
7.	Explain about evaporative pattern with a neat sketch.	Remember	3
8.	What is rapid tooling and explain the application of rapid prototype tool in manufacturing and tooling.	Remember	3
9.	What is rapid tooling and explain about shell investment casting process with its advantages and disadvantages.	Remember	3

Part - C (Problem Solving and Critical Thinking Questions)

S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1	Explain the concept modelling. Explain the application of rapid prototyping component from concept modeling and describe any three geometric modeling techniques.	Understand	3
2	Explain with a neat sketch the following concept of modeling technique Sander's model maker.	Understand	3
3	Explain with a neat sketch the following concept of modeling techniques 3D printer.	Remember	3
4	Explain the critical factors that influence the performance and functions of Selective Laser Sintering and 3-Dimensional printing.	Remember	3
5	Explain the powder based rapid prototyping systems with working principle, application, merits and demerits.	Remember	3

**UNIT-IV
RAPID PROTOTYPING DATA FORMAT**

Part - A (Short Answer Questions)

S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1.	Discuss on STL files and define slicing relevant to CAD.	Remember	4
2.	Explain the features of various rapid prototyping softwares.	Remember	4
3.	Explain the consequences of building valid and invalid tessellated models.	Remember	4
4.	Explain the concept occurring errors in SH files.	Remember	4
5.	Explain the concept of file exchange errors	Understand	4
6.	Explain the data format in rapid prototyping.	Understand	4
7.	Explain the softwares in rapid prototyping.	Understand	4

Part – B (Long Answer Questions)

S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1	Explain the STL format. Discuss the Generic and dedicated solution with example.	Apply	4
2	Explain the procedure of modeling, STL file creation and layering steps before printing 3D model in RP machine for the following types of models (i) Economical model. (ii) Precision model	Apply	4
3.	Differentiate soft tooling and hard tooling and also Compare direct tooling and indirect tooling.	Apply	4
4.	Explain the futures of RP software and summarize about solid view, view	Apply	4

	expert, 3D view and STL view in detail.		
5.	Write short on following. (i) Influence of building orientation. (ii) File exchange errors. (iii) Errors in STL files. (iv) Part building errors.	Apply	4
6.	Explain the procedure of modeling, STL file creation and layering steps before printing 3D model in RP machine for the following types of models (i) Economical model. (ii) Precision Model	Apply	4
7.	Differentiate soft tooling and hard tooling and Compare direct tooling and indirect tooling.	Apply	4
8.	Explain Arc spray metal tooling with a neat sketch	Apply	4
9.	Explain the futures of RP software and summarize about solid view, view expert, 3D view and STL view in detail.	Apply	4

Part – C (Problem Solving and Critical Thinking Questions)

S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1.	Summarize with case study rapid prototyping tooling and conventional tooling.	Apply	4
2.	Explain the procedure of modeling, STL file creation and layering steps before printing 3D model in RP machine for the following types of models	Apply	4
3.	Explain the futures of RP software and summarize about solid view, view expert, 3D View in detail.	Apply	4
4.	Explain the STL format in detail with a case study and example.	Apply	4
5	Explain in contrast “rapid prototyping tooling is required or not” to conventional machining	Apply	4
UNIT-V RAPID PROTOTYPING APPLICATIONS			

Part - A (Short Answer Questions)

S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1.	Explain with a suitable example the application of rapid prototyping in aerospace industry.	Remember	5
2.	Which rapid prototyping processes are best suited for production of ceramic part. why.	Remember	5
3.	How does aerospace technology make use of rapid tooling application.	Remember	5
4.	Summarize the applications of rapid prototyping in various industries.	Understand	5
5.	Summarize the applications of rapid prototyping in automotive sector.	Understand	5
6.	List out the applications of rapid prototyping in aerospace industry.	Understand	5
7.	Generalize the statement “material relationship effects the rapid prototyping”.	Understand	5
8.	Explain the application of analysis and planning in rapid prototyping.	Understand	5
9.	How the rapid prototyping is useful in the arts and architecture.	Understand	5
10.	Write the applications of customized implants and prosthesis.	Understand	5

Part – B (Long Answer Questions)

S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1.	Explain the applications of rapid prototyping. Summarize the application in coin making, coin industry, GIS application.	Apply	5
2.	Categorize the applications of rapid prototyping in the areas of customized implant and prosthesis, visualization of biomolecules.	Apply	5
3.	Discuss with a case study in automobile application. Describe how reverse engineering	Apply	5

	will be applied to rapid prototyping techniques.		
4.	Categorize how the material relationship will contribute in rapid prototype technique. Specify the applications in aerospace industry.	Apply	5
5.	Explain the applications of rapid prototyping. summarize the applications in engineering, analysis, aerospace industry, medical and bioengineering.	Apply	5
6.	Categorize the applications of rapid prototyping in the areas of planning and simulation of complex surgery, customized implants, design and production of medical devices.	Apply	5
7.	Discuss with a case study in medical application. Describe how reverse engineering will be applied to rapid prototyping techniques.	Apply	5
8.	Categorize how the material relationship will contribute in rapid prototype technique specify the applications in forensic science and anthropology	Apply	5
9.	Discuss with a cases study how design and production of medical devices are done by the rapid prototyping.	Remember	5
10.	Explain how forensic science and anthropology uses rapid prototyping technique.	Understand	5
Part – C (Problem Solving and Critical Thinking Questions)			
S No	QUESTION BANK	Blooms Taxonomy level	Course Learning Outcomes
1	Summarize why the rapid prototyping is essentially applied in the aerospace and automotive industry.	Apply	5
2.	Explain in contrast how the rapid prototyping application is differs from conventional manufacturing.	Apply	5
3.	Summarize the statement “ rapid prototyping uses the effective use of material, production ease of manufacturing and tooling”.	Apply	5
4.	Discuss with a cases study how forensic and anthropology are done by the rapid prototyping.	Apply	5
5.	Categorize how the material relationship will contribute in rapid prototype technique specify the applications in medical and bio-engineering.	Apply	5

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