INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

MECHANICAL ENGINEERING

TUTORIAL QUESTION BANK

Course Name	**DESIGN FOR MANFACTURING AND ASSEMBLY**
Course Code	**A70339**
Class	IV B.Tech I Semester, JNTUH - R-15
Branch	Mechanical Engineering
Year	2018 - 2019
Course Coordinator	Mr. A Venuprasad, Assistant Professor, Department of Mechanical Engineering.

COURSE OBJECTIVES

Design for Manufacturing is the method of design for ease of manufacturing of the collection of parts that will form the product after assembly. Design for manufacturing and assembly is the combination two methodologies; Design of manufacture, which means the design of ease of manufacture of the parts that will form a product covers basic design philosophy, creativity in product design, selection of materials for engineering applications, design rules for machining, design rules for joining, casting, forming and important factors in product assembly and design for assembly which means the design of the product for ease of assembly.

S No	QUESTION BANK	Blooms Taxonomy level	Course Outcomes
	UNIT – I **INTRODUCTION TO DESIGN**		
Part - A (Short Answer Questions)			
1	Explain all aspects of creative thinking for product development.	Understand	1
2	Briefly explain various mental blocks in the process of creative thinking.	Remember	1
3	Briefly explain importance of product design.	Understand	1
4	Explain design philosophy in product design.	Remember	1
5	Explain types of design and its advantages.	Understand	2
6	Compare scientific method and design method.	Remember	2
7	Discuss problem solving methodology.	Understand	2
8	Discuss phases of design and explain any two types of phases.	Remember	2
9	Explain design rules for manufacturability.	Remember	2
10	Discuss compatibility between processes and materials.	Understand	2
Part - B (Long Answer Questions)			
1	Explain the design philosophy, steps involved in design process.	Remember	1
2	Discuss the design rules of manufacturability.	Understand	1
3	Explain the criteria for material selection.	Understand	1
4	Discuss the selection interrelationship with process selection.	Remember	1
5	Explain briefly process selection charts.	Understand	1
6	Explain steps involved in design process.	Understand	2
7	Discuss about phases of design briefly.	Understand	2
8	Explain briefly importance of product design & explain design philosophy in product design.	Remember	2
9	Explain the principles which are to be followed while designing a product considering the economical aspects.	Understand	2
10	Enumerate design rules and guidelines applicable to dimensional tolerances of various machining processes. What is design for machining.	Remember	2

Part - C (Problem Solving and Critical Thinking Questions)			
1.	The factor of material selection will influence both design and manufacture" Justify the statement by considering each factor what is the need for new materials in high technology domains.	Understand	1
2.	Enumerate design rules and guidelines applicable to dimensional tolerances of various machining processes. What is design for machining.	Remember	1
3.	Draw the schematic diagram of the basic elements of a design process and explain them briefly.	Understand	2
4.	Distinguish between design for manufacturing and detailed design explaining the terms involved.	Remember	2
UNIT-II MACHINING PROCESS			
Part – A (Short Answer Questions)			
1	Discuss why tolerance is specified for machining process.	Understand	3
2	Explain design guidelines for machining.	Remember	3
3	Explain factors for machining ease.	Understand	3
4	Discuss dimensional tolerances and surface finish? Give examples of poor and good design for machining.	Understand	3
5	Explain general design recommendations for machined parts.	Understand	4
6	Discuss processing of plastics.	Understand	4
7	Explain the unconventional machining process.	Remember	4
8	Discuss the machining process.	Understand	5
9	Explain the developments in casting process.	Understand	5
10	Explain the various welding process.	Remember	5
Part - B (Long Answer Questions)			
1	Explain the design and guidelines for machining processes.	Understand	3
2	Explain with a case study redesign of components for machining ease.	Remember	3
3	Discuss design rules for machining with suitable examples.	Understand	3
4	Explain the procedure for dimensional tolerances fixing for machining	Understand	4
5	What do you understand by surface roughness discuss various processes for surface finish.	Understand	4
6	Explain the general design considerations for casting processes with respect to a. Economical molding. b. Solidification. c. Surface integrity d. Fettling and cleaning.	Remember	4
7	a. Discuss redesigning of components for machining ease with the help of an example. b. What are the general design recommendations given for machined parts.	Understand	5
8	Discus importance of ASHBY charts for material selection.	Remember	5
9	Explain the steps for material substitution in design.	Understand	5
10	Discus steps in selection of manufacturing process with a case study & Explain process selection matrix with an example.	Understand	5
Part – C (Problem Solving and Critical Thinking)			
1	Explain with suitable example the steps in improving the design of component from machining point of view.	Remember	3
2	Explain the design for machining? Enumerate design rules and guidelines applicable to dimensional tolerances of various machining processes.	Understand	3
3.	Compare the various grinding process for improving surface finish.	Remember	4
4.	Distinguish between design and redesign of components for machining ease.	Understand	4
5	What do you understand by redesigning a machined component, and why it is necessary, with an example.	Understand	5

UNIT-III **METAL CASTING, METAL JOINING**			
Part - A (Short Answer Questions)			
1.	List out the materials used to cast in investment casting.	Remember	6
2.	List any three applications of die casting.	Remember	6
3	Differentiate between investment casting and die casting.	Understand	6
4.	Explain the general design for consideration for casting processes.	Remember	6
5.	Explain is sand casting and advantages of casting process.	Understand	6
6.	Discuss is shell moulding process and application.	Understand	7
7.	What is the function of core.	Understand	7
8.	List types of pattern and its application.	Remember	7
9.	Explain casting tolerance.	Understand	7
10.	Discuss design of gating system.	Understand	7
1	Explain arc welding processes.	Remember	7
2	Explain is the solid phase welding processes.	Understand	7
3	Discuss classification of welding process.	Remember	8
4	Explain the applications for important welding process.	Understand	8
5	Explain various types of joints designs	Remember	8
6	Explain flame brazing and what type of gas is used for brazing.	Remember	8
7	Evaluate various joints designs in brazing.	Understand	8
8	Discuss furnace brazing and its advantages.	Remember	8
9	Explain design guide lines for welding fabrication.	Understand	8
10	Discuss stress relieving and selection of heat treatment cycle for steel.	Remember	8
Part – B (Long Answer Questions)			
1	Explain investment casting & Discuss advantages and limitations investment casting process.	Understand	6
2	Explain centrifugal casting & Discuss advantages and limitations centrifugal casting process.	Remember	6
3	Explain cold and hot chamber die casting & discuss advantages and limitations of die casting.	Understand	6
4	Compare product design rules for sand casting with general design rules.	Remember	6
5	List out and explain the effect of casting defects.	Remember	7
6	Explain the important guidelines for casting process.	Understand	7
7	Compare product design rules for sand casting with general design rules.	Remember	7
8.	Enumerate design rules and guidelines applicable to casting tolerances.	Understand	7
9.	Discuss solidification simulation and compare shop floor and simulation methods for casting.	Remember	7
10	Explain shell moulding & discuss advantages and disadvantages of shell moulding process.	Understand	7
1	Discuss pre and post heat treatments of welded joints.	Remember	7
2	Explain design rules for brazed joints.	Understand	7
3	Explain the general design guidelines of welding.	Remember	7
4	Discuss the effects of thermal stresses in welding.	Understand	7
5	Explain the chief factors in the design of a weldment.	Remember	8
6	Explain the effect of thermal stresses in weld joints and briefly discuss the design of brazed joints.	Understand	8
7	Explain the design considerations of for weldments.	Remember	8
8	a) Explain flame brazing and furnace brazing and discuss application of induction and resistance brazing.	Understand	8
9	Explain methods to minimize welded fabrication.	Understand	8
10	Explain importance of post weld heat treatment in welding.	Understand	8

Part - C (Problem Solving and Critical Thinking Questions)			
1	Explain the importance of solidification and simulation in casting design.	Understand	6
2	Explain design principles for die casting & discuss design of gating system.	Understand	6
3	What are general design considerations for casting processes with respect to a. Economical moulding b. Solidification c. Surface integrity d Fettling and cleaning	Remember	7
4	Discuss solidification simulation& compare shop floor and simulation methods for casting.	Understand	7
5	Explain solidification mechanism in sand casing & discuss design of gating system.	Remember	8
1	Discuss the general design guidelines of welding, explain post and pre Treatment of welding.	Understand	8
2	Compare the welding and brazing processes with respect to design of joints.	Remember	8
3	Analyze various edge preparations for joint design and explain various types of joint designs.	Understand	8
4	Explain method of calculating preheat temperatures for various types of steels	Understand	8
5	Explain how residual stresses are formed during welding & discuss the effect of residual stress in welded fabrication.	Understand	8
UNIT-IV FORGING, EXTRUSION			
Part - A (Short Answer Questions)			
1.	Explain various materials used for forging dies with examples.	Understand	9
2.	Discuss closed die forging.	Understand	9
3.	Define the design concepts for drop forging die.	Remember	9
4.	Explain design guidelines for extrusion.	Understand	10
6.	Discuss punching operation for sheet metal work with applications.	Understand	10
7.	Explain bending operation with a neat sketch, applications.	Remember	10
8.	Discuss blanking operation with applications.	Understand	10
9.	Explain deep drawing operation with applications	Remember	10
10.	Discuss keeler goodman forming limit diagram	Understand	10
Part – B (Long Answer Questions)			
1.	Discuss the design guidelines for extruded sections.	Understand	10
2.	Explain the design principles for punching and blanking.	Remember	11
3.	Define the design principles for bending.	Understand	11
4.	Explain the design principles for deep drawing.	Understand	11
5.	Discuss the keeler Goodman Forming line diagram.	Understand	11
6.	Compare forward and backward extrusion.	Remember	11
7.	Discuss manufacturing seamless tubes.	Understand	11
8.	Explain the design guidelines for forged components	Understand	11
9	Determine the shape and position of parting line in the design of forging die.	Understand	11
10	What are the design factors to be considered for forging operation? Explain.	Remember	11
Part - C (Problem Solving and Critical Thinking Questions)			
1.	Explain design of closed die forging design and drop forging die design with a neat sketch.	Understand	9
2.	Compare forward and backward extrusion processes with neat sketches.	Remember	10
3.	Explain keeler Goodman limit diagram to get defect free drawing.	Understand	10
4.	Compare blanking and piercing operation.	Remember	11
5	Discuss design guidelines for extrusion of industrial products	Remember	11
UNIT-V DESIGN OF ASSEMBLY			
Part - A (Short Answer Questions)			
1	What is meant by assembly method.	Understand	12
2.	Discuss assembly methods.	Remember	12

3.	Explain the social effects of automation.	Understand	12
4.	Explain automation in detail.	Understand	12
5.	Summarize about automatic assembly transfer systems.	Remember	13
6.	Explain about indexing mechanisms.	Understand	13
7.	Summarize the merits and demerits of assembly	Understand	13
8	Explain factors for layout design?	Remember	13
9	Discuss manual assembly and its advantages.	Understand	14
10	Discuss automated assembly and its advantages.	Understand	14
Part – B (Long Answer Questions)			
1	Explain the general design guidelines for manual assembly.	Understand	14
2.	Explain the system for manual insertion and fastening.	Understand	14
3.	Explain design for assembly fits in the design process.	Remember	14
4.	Describe the classification system for manual handling.	Understand	15
5.	Explain design guidelines for part assembly.	Understand	15
6.	Explain the effects of chamfer design and insertion operation.	Remember	15
7	Explain design guidelines for automatic assembly.	Understand	15
8	Discuss systematic DFA assembly & What is manual assembly?	Remember	15
9	Discuss industrial applications for automatic assembly.	Understand	15
10	Explain the importance of automation in assembly.	Understand	15
Part - C (Problem Solving and Critical Thinking Questions)			
1.	Describe the approaches based on design principles and rules for design for assembly methods.	Understand	13
2.	Explain the development of the systematic DFA methodology.	Understand	14
3.	Explain in detail system for manual insertion and fastening with examples and neat sketches.	Remember	15
4.	Explain in detail design of fits in design process, general design guidelines in manual assembly.	Understand	15
5	Discuss industrial applications for automatic assembly & apply design guidelines for manual assembly for typical product	Remember	14

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