INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

MECHANICAL ENGINEERING
TUTORIAL QUESTION BANK

Course Name	**PRODUCTION TECHNOLOGY**
Course Code	**AME006**
Class	IV Semester
Branch	Mechanical Engineering
Year	2018 – 2019
Course Coordinator	Dr. G. Naveen Kumar
Course Faculty	Dr. G. Naveen Kumar, Professor C. Labesh Kumar, Assistant Professor

COURSE OBJECTIVES:

The course should enable the students:

I	Comprehensive understanding of different manufacturing processes for product development.
II	Apply, casting, metal joining and forming processes for various industries.
III	Select process parameters, equipment for material processing.

COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

AME006.01	Understand various manufacturing processes used in various industries.
AME006.02	Explain the steps involved in casting processes
AME006.03	Use design principles to incorporate sprue, runner, gates, and risers in foundry practice.
AME006.04	Evaluate properties of sand for use in sand casting.
AME006.05	Solve problems and find methods to rectify casting defects.
AME006.06	Demonstrate the preparation of moulds for various casting processes
AME006.07	Describe applications of various casting processes
AME006.08	Explain principles of welding, brazing and soldering processes..
AME006.09	Demonstrate use of welding equipment for various industrial applications.
AME006.10	Demonstrate use of Brazing and soldering equipment for various industrial applications.
AME006.11	Explain design of welded joints, residual stresses, distortion and control.
AME006.12	Explain causes and remedies of welding defects.
AME006.13	Compare destructive and non-destructive testing techniques.
AME006.14	Understand the affect of heat input in welds.
AME006.15	Understand the importance of sheet metal forming, bending, and deep drawing.
AME006.16	Compare extrusion and forging processes to identify advantages and limitations.
AME006.17	Enable students to understand various manufacturing processes for industrial applications.
AME006.18	Enable students to understand importance of manufacturing for lifelong learning, Higher Education and competitive exams.

UNIT – I			
CASTINGS			
Part - A (Short Answer Questions)			
S No	QUESTION	Blooms Taxonomy Level	Course Learning Outcomes
1	List the common pattern materials.	Understand	AME006.01
2	List different types of sand for sand moulds.	Understand	AME006.01
3	What are different types of binder used in sand casting?	Remember	AME006.01
4	Define green strength of molding sand?	Remember	AME006.01
5	Define permeability of molding sand?	Remember	AME006.01
6	Define cope, drag and cheek?	Understand	AME006.01
7	Define refractoriness of the sand material?	Understand	AME006.01
8	Define flowability or the sand material?	Understand	AME006.01
9	Define dry strength or the sand mould?	Remember	AME006.02
10	Define collapsibility of the sand mould?	Remember	AME006.02
11	Define hot strength of the sand material?	Remember	AME006.02
12	Define Adhesiveness of the sand material?	Understand	AME006.02
13	What is the effect of cohesiveness of the sand material?	Understand	AME006.02
14	What is the use of cone?	Remember	AME006.02
15	What is the use of chaplets?	Remember	AME006.02
16	What is the use of facing sand?	Remember	AME006.03
17	Define parting line in casting.	Remember	AME006.03
18	What is the function of a Riser?	Remember	AME006.03
19	Define fettling process in casting?	Understand	AME006.03
20	What is rapping allowance?	Understand	AME006.03
Part - B (Long Answer Questions)			
1	Explain various manufacturing processes. As an engineer when would you prefer selecting Casting as a manufacturing process?	Understand	AME006.01
2	Define a mould. Make a sketch of a mould and identify its different elements.	Remember	AME006.02
3	Discuss the solidification process for pure metal and an alloy in casting.	Understand	AME006.02
4	Draw a sketch to describe the procedure of placing sprue and risers in sand mould.	Understand	AME006.03
5	What is a pattern? Explain different materials suitable for pattern making.	Remember	AME006.02
6	Name different types of patterns. Explain with neat sketch about split pattern and discuss its use.	Remember	AME006.02
7	What are the requirements of a good gating system? Draw a sketch of a gating system and explain the functions of various elements.	Understand	AME006.03
8	What are the essential properties of molding sand? Briefly explain them.	Understand	AME006.04
9	What is the function of a core? What are core prints?	Remember	AME006.03
10	Compare the hot chamber and cold chamber method of die casting.	Understand	AME006.06
11	What are the advantages and limitations of casting process?	Remember	AME006.02
12	What are the basic requirements of a mould? Name different mould materials.	Understand	AME006.03

13	What factors affect the choice of a particular casting process? Discuss.	Understand	AME006.02
14	Distinguish between a pattern, a mould and a casting.	Remember	AME006.02
15	What are the allowances to be given on a pattern? Explain in detail.	Remember	AME006.03
16	Discuss: (i) sweep pattern (ii) gated pattern	Understand	AME006.03
17	Differentiate between runners and risers.	Understand	AME006.03
18	Explain various sand testing methods.	Remember	AME006.03
19	Explain the characteristics of core. Briefly explain various types of cores.	Remember	AME006.03
20	With neat sketch explain investment casting process and give its applications.	Understand	AME006.07
Part - C (Problem Solving and Critical Thinking Questions)			
1	Why coarse sand is better for steel casting than fine grained sand? Why is it that as castings increase in size, it is often better to use increasing coarse sand?	Understand	AME006.04
2	With the help of sketches, discuss the various design considerations for designing the sand mould castings.	Understand	AME006.03
3	Why die casting method is mainly used for non ferrous metals? Explain.	Understand	AME006.06
4	Why venting is necessary in die casting and how it is used?	Understand	AME006.05
5	Why are ejector pins required in die casting? Explain	Remember	AME006.02
6	Why cooling of dies is necessary during their operation?	Remember	AME006.05
7	How the dies for die casting are manufactured? Explain.	Remember	AME006.06
8	State and explain the shell moulding casting process with neat sketch.	Remember	AME006.03
9	Discuss about the size of a cylindrical riser necessary to feed a steel slab casting with a side riser, casting pouring horizontally into the mould.	Understand	AME006.03
10	Compare the solidification times for castings of three different shapes of same volume: Cubic, cylindrical(with height equal to its diameter) and spherical.	Understand	AME006.07
UNIT - II			
WELDING-I			
Part – A (Short Answer Questions)			
S No	**QUESTION**	**Blooms Taxonomy Level**	**Course Learning Outcomes**
1	What is the use of flux in welding?	Remember	AME006.08
2	Write a short note on butt welding.	Understand	AME006.08
3	List out minimum six types of welding process.	Understand	AME006.06
4	Write a short note on the symbol of weld?	Understand	AME006.06
5	List out the sources of energy used for welding?	Understand	AME006.07
6	What is the use of filler material in welding?	Remember	AME006.05
7	Define carburizing flame and give its ratio?	Remember	AME006.05
8	Define oxidizing flame and give its ratio?	Remember	AME006.07
9	Define neutral flame and give its ratio?	Remember	AME006.08
10	List out the gases used in gas welding?	Remember	AME006.08
11	What is the use of heat gas in welding?	Remember	AME006.08
12	What is the source of welding heat in Thermit welding?	Remember	AME006.09
13	What reaction takes place in thermit welding?	Remember	AME006.09

14	List out the electrode materials used in welding?	Remember	AME006.09
15	List out the chemical reactions on thermite welding?	Remember	AME006.09
16	What is the application of thermit welding?	Remember	AME006.09
17	What is forge welding and how any types are there?	Remember	AME006.08
18	What is the function of coating material in coated electrodes?	Remember	AME006.08
19	Write the principle of resistance welding.	Understand	AME006.08
20	What are main factors to be considered in resistance welding?	Remember	AME006.08
Part - B (Long Answer Questions)			
1	Discuss classification of welding processes.	Understand	AME006.08
2	Explain different types of flames with neat sketches in gas welding process. Give applications for each type.	Understand	AME006.08
3	Explain the advantages and limitations of oxy-acetylene welding	Understand	AME006.08
4	Discuss shielded metal arc welding process with a neat sketch.	Remember	AME006.09
5	Explain the function of coating in shielded metal arc welding process.	Remember	AME006.09
6	Discuss electric resistance spot welding process. Explain nugget formation.	Remember	AME006.09
7	Compare resistance spot and seam welding.	Remember	AME006.09
8	Compare resistance upset butt and flash butt welding process	Understand	AME006.09
9	Explain with neat sketch thermit welding process.	Understand	AME006.10
10	Discuss estimation of cost for shielded metal arc welding process.	Remember	AME006.10
11	Compare gas welding and cutting processes.	Remember	AME006.10
12	Discuss the oxy-acetylene welding process setup.	Understand	AME006.10
13	What are the various safety aspects in gas welding? Explain.	Understand	AME006.10
14	Explain the advantages and disadvantages of shielded metal arc welding.	Understand	AME006.10
15	Define polarity as applied to DC arc welding. How is this advantageously used?	Understand	AME006.09
16	Discuss parameters used in resistance spot welding process. Give the industrial applications of spot welding process.	Remember	AME006.08
17	Explain projection welding process and its application.	Remember	AME006.09
18	Discuss the sequence of flash butt welding process. Give applications.	Remember	AME006.09
19	Discuss the advantages and limitations of thermite welding process.	Understand	AME006.08
20	Explain the calculation of productivity in arc welding.	Understand	AME006.08
Part – C (Problem Solving and Critical Thinking)			
1	Classify the different regions of oxy-acetylene flame and with the help of neat sketches explain their characteristics.	Remember	AME006.08
2	State the purpose of Thermit welding. Where would you recommend it and why?	Remember	AME006.09
3	Why is cleaning of metal is important for successful resistance welding? Explain.	Remember	AME006.08
4	Calculate the melting efficiency in the case of arc welding of steel with a potential of 20V and current of 200A. The travel speed is 5mm/s and the cross sectional area of the joint is $20mm^2$. Heat required to melt steel may be taken as $10J/mm^3$ and the heat transfer efficiency as 0.85.	Remember	AME006.08
5	Explain the effect of “Thermal conductivity” and “Thermal expansion” on welding process.	Understand	AME006.08

6	In an arc welding process, the voltage and current are 25V and 300A respectively. The arc heat transfer efficiency is 0.85 and welding speed is 8mm/s. What is the net heat input in J/mm?	Understand	AME006.08
7	Why do we do the edge preparation before welding? What are the different ways of edge preparation techniques?	Understand	AME006.11
8	Write primary and secondary combustion equations in oxy-acetylene gas welding process. Is it an endothermic process or exothermic process?	Remember	AME006.08
9	In a given arc welding operation, the power source is at 20V and current is at 300A. If the electrode travel speed is 6mm/s, calculate the cross sectional area of the joint. The heat transfer efficiency is 0.8 and melting efficiency is 0.30. Heat required to melt the steel is 10J/mm^2.	Remember	AME006.08
10	Assume that two 1.5mm thick steel sheets are being spot welded at a current of 5500A and current flow time t=0.15s. Using electrodes 6mm in diameter, estimate the amount of heat generated and its distribution in the weld zone. Use an effective resistance of 250μΩ.	Remember	AME006.08
UNIT-III			
WELDING-II			
Part - A (Short Answer Questions)			
S No	**QUESTION**	**Blooms Taxonomy Level**	**Course Learning Outcomes**
1	Differentiate between TIG welding and MIG welding.	Understand	AME006.09
2	Write the constituents of electrode coating with their functions.	Understand	AME006.08
3	What is heat shrinkage in spot welding?	Remember	AME006.11
4	What is the effect of clearance in brazing?	Understand	AME006.10
5	What is the need of flux in brazing?	Understand	AME006.10
6	What are the process variables in explosive welding?	Understand	AME006.09
7	What are the modes of metal transfer in arc welding?	Understand	AME006.09
8	How is brazing different from welding and soldering?	Understand	AME006.10
9	Define solid state welding?	Remember	AME006.09
10	What are the functions of coating in coated electrode?	Understand	AME006.09
11	List out various defects caused in welding.	Understand	AME006.12
12	What are the various destructive and non-destructive testing techniques used to test the quality of welded joints?	Remember	AME006.13
13	What do you mean by non-destructive testing of welds?	Understand	AME006.13
14	Write a short note on visual inspection methods.	Understand	AME006.13
15	What is the effect of carbon in welding of plain carbon steels?	Remember	AME006.08
16	What are the sources of weld spatter? How can it be controlled?	Remember	AME006.11
17	Why is the quality of SAW very good?	Understand	AME006.11
18	What is the effect of preheating in welding?	Remember	AME006.14
19	State some of the NDT techniques used for testing weldments.	Understand	AME006.13
20	State some of the Destructive testing techniques used for testing weldments.	Understand	AME006.13

Part – B (Long Answer Questions)			
1	How to carry out manual arc welding process? Explain the procedure.	Understand	AME006.08
2	Explain the spot welding cycle with neat sketch.	Understand	AME006.09
3	Explain the various types of resistance welding processes. What are the advantages, disadvantages and their limitations?	Understand	AME006.09
4	Explain explosive welding with a neat sketch.	Remember	AME006.09
5	Explain briefly about brazing operation.	Remember	AME006.10
6	What is laser welding? Explain with application, advantages and disadvantages.	Remember	AME006.09
7	Write the weld properties, advantages and limitations of friction welding.	Understand	AME006.09
8	Explain about brazing process with applications.	Understand	AME006.10
9	What is soldering? Explain with applications.	Remember	AME006.10
10	Discuss some of the attractive features of gas tungsten arc welding Process. What are the various gases used in this process?	Remember	AME006.09
11	What do you understand by heat affected zone in welding?	Understand	AME006.14
12	List the various welding defects which commonly occur. Discuss them in brief.	Remember	AME006.12
13	What are the destructive testing methods used in welding? Explain.	Understand	AME006.13
14	Explain non-destructive testing methods for welding.	Remember	AME006.13
15	Explain the term HAZ in welding and its role in the success of a weldment.	Understand	AME006.14
16	Why do properties vary widely in most welding heat affected zones?	Understand	AME006.14
17	Name the various destructive and non-destructive testing methods for welds. Explain the principle of radiography with neat sketches.	Remember	AME006.13
18	Describe briefly the following non-destructive testing methods, (i) Magnetic particle test (ii) Eddy current test	Remember	AME006.13
19	List any five welding defects and describe the consequences of those defects and remedies.	Remember	AME006.12
20	What is heat affect zone and explain briefly the metallurgical transformations during welding.	Understand	AME006.14
Part – C (Problem Solving and Critical Thinking)			
1	Can we join dissimilar materials? If so give those process names and describe the basic principle of working.	Understand	AME006.09
2	Which welding technology out of TIG/MIG welding uses non consumable electrode? Explain that process with neat diagram.	Understand	AME006.09
3	Why DC arc welding is more used than AC arc welding in specialized applications?	Remember	AME006.09
4	The voltage length characteristic of a DC arc is given by V=20+30l, where 'V' is the arc voltage and 'l' is the length of arc in cm. Determine the open circuit voltage and short circuit current for arc lengths ranging from 3 to 5mm and current ranging from 200 to 400Amp during welding operation.	Remember	AME006.08

5	The voltage length characteristic of a DC arc is given by V=20+40l, where 'V' is the arc voltage and 'l' is the length of arc in cm. The power source characteristic is approximated by a straight line with an open circuit voltage is 80V and short circuit current is 300Amp.(i) When the arc length is changed from 3 to 5mm, Calculate change in arc power. (ii) Calculate arc length at a maximum current of 200Amp.	Understand	AME006.08
6	During welding, the parent metal in HAZ undergoes certain changes, Discuss these changes.	Understand	AME006.14
7	Explain how cracking in weldments can be avoided.	Understand	AME006.12
8	Explain the technical meaning of: (a) Hot cracking (b) Cold cracking (c) Grain growth (d) Recrystallization	Remember	AME006.12
9	Which one of the following NDT would be used to examine a completed weld for surface defects: (a) Ultrasonics (b) Dye-penetrate (c) Radiography (d) Acoustics Explain that process.	Understand	AME006.13
10	Which of the following would help to reduce distortion? (a) Concentration of welding to one area (b) Increasing the input of welding heat (c) Use of single V-preparation (d) Use of welding sequence Justify your answer.	Remember	AME006.11
UNIT-IV			
FORMING			
Part – A (Short Answer Questions)			
S No	**QUESTION**	**Blooms Taxonomy Level**	**Course Learning Outcomes**
1	Define recrystallization temperature?	Remember	AME006.15
2	What are different types of rolling techniques?	Remember	AME006.15
3	What is the process involved in making internal gears?	Remember	AME006.15
4	What are the various forces involved in rolling process?	Understand	AME006.15
5	Write any four disadvantages of Hot working process?	Understand	AME006.13
6	What are the operations used for making a compound die?	Understand	AME006.13
7	What is the process used for making the parts of circular cross-section which are symmetrical about the axis of rotation	Remember	AME006.13
8	What are various types of rolling mills?	Understand	AME006.15
9	Describe the process of deep drawing?	Remember	AME006.12
10	How are tensile strength, yield strength and hardness affected with cold working process?	Understand	AME006.12
11	Write a short note on specialized types of piercing techniques.	Remember	AME006.12
12	Define forming in terms of bending?	Understand	AME006.12
13	What is meant by swaging?	Remember	AME006.15
14	List out the factors effecting shearing operation?	Remember	AME006.15

15	What type of metals is preferred for wire drawing?	Understand	AME006.15
16	What is meant by grain growth?	Remember	AME006.12
17	List out the types of presses used in sheet metal operations?	Remember	AME006.12
18	What are the power requirements for rolling process?	Remember	AME006.12
19	Write a short note on the process of wire drawing.	Remember	AME006.12
20	What happens when the grain structure of metal is refined?	Remember	AME006.12
Part – B (Long Answer Questions)			
S No	**QUESTION**	**Blooms Taxonomy Level**	**Course Learning Outcomes**
1	Explain advantages and disadvantages of hot and cold working.	Understand	AME006.11
2	Compare properties obtained by cold and hot working process.	Understand	AME006.11
3	Name and sketch different metal forming processes.	Remember	AME006.11
4	Name some important products manufactured by metal forming processes.	Remember	AME006.11
5	What are the types of rolling processes? What products are made by rolling processes?	Understand	AME006.11
6	Explain how do you find force and power requirement for rolling processes?	Remember	AME006.12
7	Compare blanking and piercing.	Understand	AME006.12
8	Explain bending. How do you find the forces required for bending of sheet metal?	Remember	AME006.12
9	Explain wire and tube drawing.	Understand	AME006.12
10	Differentiate hot and cold spinning process.	Understand	AME006.12
11	Discuss various types of presses and press tools.	Understand	AME006.12
12	Explain how do you find the force requirement in drawing?	Remember	AME006.13
13	Explain deep drawing process.	Remember	AME006.13
14	What do you mean by forming limit diagram?	Understand	AME006.13
15	How do you find the forces required in deep drawing?	Remember	AME006.13
16	Explain compound die with a neat sketch.	Understand	AME006.13
17	Discuss defects and remedies in deep drawing.	Understand	AME006.13
18	Explain spring back in bending operation.	Remember	AME006.13
19	Write a short note on coining process.	Remember	AME006.13
20	What are various types of stamping techniques? Explain in detail.	Understand	AME006.13
Part – C (Problem Solving and Critical Thinking)			
1	Explain working principle of hydraulic and pneumatic press hot working and cold working process?	Understand	AME006.12
2	Differentiate hot working and cold working process.	Understand	AME006.12
3	How are Blanking and piercing operations performed simultaneously in making compound die?	Remember	AME006.12
4	Explain different types of sheet metal operations?	Remember	AME006.13
5	Explain the parameters to be considered in bending a sheet metal with neat diagram?	Remember	AME006.13
6	How are the forces calculated for performing rolling operation?	Understand	AME006.13
7	Differentiate flat rolling and ring rolling.	Understand	AME006.15
8	Explain strain hardening techniques involved in automobile industry	Understand	AME006.15

9	Write a note on micro stamping.	Understand	AME006.15
10	How is tool life estimated in Blanking and piercing techniques?	Understand	AME006.15
UNIT-V			
EXTRUSION, FORGING			
Part - A (Short Answer Questions)			
1	What are the metals suitable for hot extrusion?	Understand	AME006.14
2	What are the advantages of open die forging?	Remember	AME006.14
3	List out the limitations of direct extrusion?	Remember	AME006.14
4	What are the tools required for forging?	Remember	AME006.14
5	Explain the effect of friction in extrusion process?	Understand	AME006.14
6	Name the applications of tube extrusion?	Understand	AME006.14
7	What is the principle of forging process?	Understand	AME006.14
8	What is the technique used for making cold chisels?	Understand	AME006.14
9	Name some fluids used in hydrostatic extrusion.	Understand	AME006.15
10	How is length of the tool and pressure related in backward extrusion process?	Understand	AME006.15
11	What is the principle of forging technique?	Remember	AME006.15
12	What is the operation used for making bolt heads?	Remember	AME006.15
13	What is the reciprocating speed of hydraulic punch in impact extrusion?	Remember	AME006.15
14	Write any three defects of forging.	Understand	AME006.15
15	How is cross sectional area of metal affected with application of force in the direction perpendicular to length axis in smith forging?	Understand	AME006.15
16	How is ductility of a metal affected in cold forging process?	Understand	AME006.16
17	What are the materials used for making forging hammers?	Remember	AME006.16
18	What is the suitable temperature for performing hot forging in aluminum alloys?	Understand	AME006.16
19	Write a note on drop forging.	Understand	AME006.16
20	What are the properties that can be improved by hydrostatic extrusion?	Understand	AME006.16
Part - B (Long Answer Questions)			
1	Explain forward and back ward extrusion.	Understand	AME006.14
2	Discuss the process of impact extrusion	Understand	AME006.14
3	What are the advantages of hydrostatic extrusion?	Understand	AME006.14
4	Explain manufacture of seamless tubes by extrusion process.	Understand	AME006.14
5	Compare hot and cold extrusion.	Remember	AME006.14
6	How do you find the forces in extrusion operation?	Remember	AME006.15
7	Explain tube and pipe extrusion process.	Remember	AME006.15
8	Discuss defects in extrusion.	Understand	AME006.15
9	Discuss factors for die design in extrusion.	Understand	AME006.15
10	What are the lubricants used in extrusion processes?	Understand	AME006.15
11	Explain various forging processes.	Remember	AME006.15
12	What are various types of hammers and presses?	Remember	AME006.16
13	Discuss any five forging defects.	Remember	AME006.16
14	What do you understand by isothermal forging and incremental forging?	Remember	AME006.16

15	Differentiate between drop forging and press forging.	Understand	AME006.17
16	Compare open die and closed die forging.	Understand	AME006.17
17	Explain advantages and limitations of roll forging.	Understand	AME006.17
18	Explain advantages and limitations of swaging.	Remember	AME006.18
19	Explain how you find the forces in forging operation.	Remember	AME006.18
20	Explain advantages and limitations of mechanical forging presses.	Remember	AME006.18
Part – C (Problem Solving and Critical Thinking)			
1	Determine forms when a material is subjected to extension process.	Understand	AME006.16
2	Compare the difference between forward backward and impact extension?	Understand	AME006.16
3	Determine the Principle of forging and different methods of forging?	Understand	AME006.17
4	Compare the difference between smith forging and roller forging?	Understand	AME006.17
5	What are the defects identified in forging and give remedies for each defects?	Understand	AME006.17
6	What are various forces involved in forging process? Explain briefly.	Remember	AME006.18
7	What are the considerations to be taken for making a die using extrusion?	Remember	AME006.18
8	How are internal cavities minimised during extrusion of a metal? Explain.	Understand	AME006.18
9	Write a note on metals that are included in friction extrusion process.	Understand	AME006.18
10	Write a note on tools used for forging process.	Understand	AME006.18

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