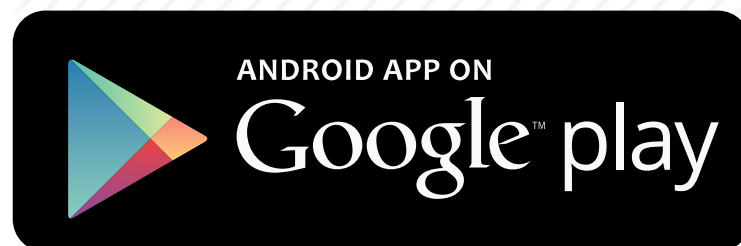


Manufacturing Process

III

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10ME55

Fifth Semester B.E. Degree Examination, June/July 2016
Manufacturing Process – III

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. Give the broad classification of metal working processes. (04 Marks)
- b. Explain Tresca and Von-Mises yield criteria. (08 Marks)
- c. The state of stress at a point is given by, $\sigma_x = 70$ MPa, $\sigma_y = 120$ MPa, $\tau_{xy} = 35$ MPa. If the yield strength of the material is 125 MPa, determine in a uniaxial tensile test, whether yielding will occur according to Tresca's and Von-Mises yield conditions or not. (08 Marks)
- 2 a. List and explain various process parameters affecting on the metal working processes. (10 Marks)
- b. Define and explain the concept of workability. (06 Marks)
- c. Write a note on deformation zone geometry. (04 Marks)
- 3 a. With simple sketches, explain different types of forging operations. (08 Marks)
- b. Explain various die-design parameters. (06 Marks)
- c. A block of lead $25\text{mm} \times 25\text{mm} \times 150\text{mm}$ is pressed between flat dies to a size of $6.25\text{mm} \times 100\text{mm} \times 150\text{mm}$. If the uniaxial flow stress is $\sigma_0 = 6.9$ MPa and $\mu = 0.25$. Determine the pressure distribution over the 100 mm dimension. (06 Marks)
- 4 a. List and explain different types of rolling mills. (10 Marks)
- b. Briefly explain different types of rolling variables. (05 Marks)
- c. What are the problems and defects occurred in rolled products? (05 Marks)

PART – B

- 5 a. With a simple sketches, explain the drawing die. (05 Marks)
- b. List and explain different methods of tube drawing. (10 Marks)
- c. What is the percentage contribution of friction to the drawing stress at 40% reduction of area using two lubricants having co-efficient of friction value, $\mu = 0.05$ and $\mu = 0.1$ with $\alpha = 15^\circ$ die and a fixed parallel plug. (05 Marks)
- 6 a. Sketch and explain basic types of extrusion. (10 Marks)
- b. Explain the different methods used in the production of seamless pipes and tubes. (10 Marks)
- 7 a. Sketch and explain a progressive die used for the production of washer. (08 Marks)
- b. Explain how a cylindrical cup is formed. (06 Marks)
- c. Explain the concept of forming limit criteria. (06 Marks)
- 8 a. Sketch and explain explosive forming. (06 Marks)
- b. Explain the different methods used for the production of metal powders in powder metallurgy. (08 Marks)
- c. List the advantages, limitations and applications of powder metallurgy. (06 Marks)

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10ME55

Fifth Semester B.E. Degree Examination, Dec.2015/Jan.2016
Manufacturing Process – III

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. Define true stress and true strain. Derive expressions showing the relationship between true stress and engineering stress as well as true strain and engineering strain. (10 Marks)
- b. Explain with a neat sketch the hydrostatic pressure in metal working. (05 Marks)
- c. Write a note on determination of flow stress. (05 Marks)
- 2 a. Explain the effect of the following on metal working processes (i) temperature, (ii) friction and lubrication. (10 Marks)
- b. Write a note on: i) deformation zone geometry, (ii) residual stresses in wrought products. (10 Marks)
- 3 a. With neat sketches, describe various types of forging processes. (06 Marks)
- b. Explain die design parameters in forging, with a neat figure. (08 Marks)
- c. Explain “friction hill concept” and the factors affecting it in forging. (06 Marks)
- 4 a. Explain with neat sketch of rolling mill (i) four high rolling mill, (ii) tandem rolling mill. (10 Marks)
- b. Discuss the effect of front tension and back tension on the rolling process, with neat figures. (08 Marks)
- c. List defects in rolling. (02 Marks)

PART – B

- 5 a. Using neat sketches explain Rod drawing and wire drawing. (08 Marks)
- b. With neat sketch, briefly explain the different features of a drawing die. (04 Marks)
- c. Explain with neat sketches different method of tube drawing. (08 Marks)
- 6 a. Give the classification of extrusion processes and explain any two processes with neat sketch. (10 Marks)
- b. Explain the following:
 - i) Metal flow and deformation during extrusion
 - ii) Defects in extrusion (10 Marks)
- 7 a. With neat sketches, explain combination die and progressive die. List the type of components produced in sheet metal work. (10 Marks)
- b. Write a note on forming limit criteria (Keeler-Goodwin diagram). (05 Marks)
- c. It is required to punch a hole of 10 mm dia in a mild steel plate of 10 mm thickness. Determine whether it is feasible or not, taking shear strength of the plate as 600 N/mm^2 and compressive strength of the punch as 2000 N/mm^2 . If it is not possible, what could be done to produce this hole? (05 Marks)
- 8 a. What is HERF? Explain explosive forming, with a neat figure. (08 Marks)
- b. With a flow chart, explain in detail the powder metallurgy process. (08 Marks)
- c. Explain any two methods of production of metal powder with sketches. (04 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice



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10ME55

Fifth Semester B.E. Degree Examination, June/July 2015
Manufacturing Process – III

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. With neat sketches, explain the classification of metal working processes on the basis of force applied. (10 Marks)
- b. Differentiate between cold working and hot working. (05 Marks)
- c. Explain the concept of true stress and true strain. (05 Marks)
- 2 a. Explain with a neat sketch, the hydrostatic pressure in metal working. (05 Marks)
- b. Explain the effect of following on metal working processes:
i) Friction ii) Lubrication iii) Strain rate (15 Marks)
- 3 a. List and explain die design parameters in forging. (06 Marks)
- b. Write a note on material flow lines in forging. (04 Marks)
- c. With a neat sketch, explain any two forging equipments. (10 Marks)
- 4 a. With neat sketches, explain the different types of rolling mills. (10 Marks)
- b. Explain the friction hill in rolling process. (04 Marks)
- c. A 300 mm wide aluminium alloy strip is hot rolled from an initial thickness of 25 mm to a final thickness of 15 mm. The diameter of the rolls is 1 m and speed of rotation is 120 rpm. The plane strain flow stress is 70 Mpa at the entrance of rolls and 110 Mpa at the exit from the roll gap due to increasing velocity. Find the rolling load and power required. Assume $\mu = 0.25$ and $\lambda = 0.5$. (06 Marks)

PART – B

- 5 a. What is drawing? With a neat sketch explain the process of rod drawing. (08 Marks)
- b. Classify the different processes used in tube drawing. With the help of suitable sketch explain the process of moving mandrel. (06 Marks)
- c. Explain optimal cone angle and dead zone formation in drawing. (06 Marks)
- 6 a. With a neat sketch, explain backward extrusion process. Why power involved in backward extrusion is much lesser than direct extrusion. (07 Marks)
- b. Briefly explain the metal flow pattern in the extrusion process with and without lubrication. (06 Marks)
- c. List and explain the various defects in extrusion. (07 Marks)
- 7 a. With neat sketches, explain the working of progressive die and combination die arrangement in sheet metal working. (10 Marks)
- b. With neat sketches explain the following processes:
i) Roll bending ii) Deep drawing. (10 Marks)
- 8 a. With a neat sketch, explain electrohydraulic forming process. (06 Marks)
- b. With a flow chart explain the operations involved in making powder metallurgy parts. (08 Marks)
- c. List the applications of powder metallurgy components. (06 Marks)

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10ME55

Fifth Semester B.E. Degree Examination, Dec.2014/Jan.2015

Manufacturing Process – III

Time: 3 hrs.

Max. Marks: 100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. Briefly explain the classification of forming process based on force applied. (10 Marks)
- b. Explain the following yield criterion:
 - i) Tresca's
 - ii) Von-Mises (05 Marks)
- c. Derive the flow stress equation. (05 Marks)
- 2 a. Discuss the effect of various parameters on metal working process. (10 Marks)
- b. Difference between cold working and hot working process. (05 Marks)
- c. Write a note on workability of materials. (05 Marks)
- 3 a. What are the assumptions made while analyzing forces during forging? Derive the expressions for forging pressures and load in open die forging by slab analysis (sliding occurs at interface). Hence find mean forging pressure.
 - i) With coulomb friction at the interface.
 - ii) With constant friction factor at the interface. (12 Marks)
- b. With neat sketch, explain the working of "Board-drop hammer". (04 Marks)
- c. Explain the parameters to be considered during die design in forging. (04 Marks)
- 4 a. With neat sketch, explain different types of rolling mill arrangements. (10 Marks)
- b. Explain the defects of rolled product. (05 Marks)
- c. In rolling a slab from 35 to 30 mm calculate the coefficient of friction and the length of arc of contact. Take the value of roll radius as 250 mm. (05 Marks)

PART – B

- 5 a. What is drawing process? Explain. (05 Marks)
- b. What are the drawing variables? Explain briefly. (05 Marks)
- c. Classify the different process used in tube drawing. With the help of suitable sketch, explain any one process. (05 Marks)
- d. Explain optimal cone angle and dead zone formation in drawing. (05 Marks)
- 6 a. Give the classification of extrusion process and explain hydrostatic extrusion process with neat sketch. (07 Marks)
- b. Explain clearly the variables influencing extrusion process. (07 Marks)
- c. It is required to extrude a cylindrical aluminum billet of 50 mm diameter to 10 mm diameter. The length of the billet is 75 mm and the average tensile yield stress for aluminum material is 170 N/mm². Calculate the force required for extrusion. Assume $\mu = 0.15$ and semi-die angle = 45°. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

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- 7 a. With neat sketch, explain the working of “progressive” and “compound die” arrangement in sheet metal working. (10 Marks)
- b. Explain the forming limit diagram. (05 Marks)
- c. A 25 mm square hole is to be cut in sheet metal of 0.75 mm thick. The shear strength of the material is 2.86×10^5 kN/m². Calculate the cutting force. (05 Marks)
- 8 a. Discuss the principle of working, advantages and application of:
- i) Explosive forming (10 Marks)
- ii) Electro hydraulic forming (05 Marks)
- b. Explain the “atomization” method of powder production in powder metallurgy. (05 Marks)
- c. What is “sintering”? Explain its mechanism. (05 Marks)

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10ME55

Fifth Semester B.E. Degree Examination, June / July 2014
Manufacturing Process - III

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART – A

- 1
 - a. Compare Hot working and Cold working processes. (08 Marks)
 - b. A Copper wire has a nominal breaking strength of 300MPa. Its ductility is 77% reduction of area. Calculate the true stress for fracture. (05 Marks)
 - c. Derive the equation for principal stresses. (07 Marks)

- 2
 - a. Discuss the effect of: i) Friction ii) Lubrication on metal working process. (08 Marks)
 - b. Write a note on :
 - i) Deformation zone geometry ii) Workability of materials iii) Residual stresses in wrought products. (12 Marks)

- 3
 - a. Classify and explain the various forging process, with neat sketches. (08 Marks)
 - b. A circular bar of 150mm dia and 100mm height is forged at room temperature between two flat dies to 25mm height. Determine the yield strength, average die pressure, as well as maximum die pressures at the beginning of plastic deformation and at the end of compression. The yield strength of the material is given as $\sigma = 100.0 (0.0085 + \epsilon)^{0.39}$ N/mm² and $\mu = 0.1$. (12 Marks)

- 4
 - a. Explain the commonly used rolling mill arrangements in today's manufacturing industry. (10 Marks)
 - b. A roll mill has roll dia of 850mm. Calculate the maximum reduction possible in this mill if the coefficient of friction is 0.3. Determine the rolling load required to obtain 25% reduction of a metal strip of 35mm thickness using the same rolling mill, given the average yield strength of the metal as 180MPa and strip width as 690mm. (10 Marks)

PART – B

- 5
 - a. Discuss redundant work and its estimation in drawing. (10 Marks)
 - b. List and explain a few important process variables that affect the drawing force in wire drawing process. (06 Marks)
 - c. Explain tube drawing with a floating mandrel. (04 Marks)

- 6
 - a. Explain the sketches : i) Indirect extrusion ii) Hydro static extrusion. (08 Marks)
 - b. Write a note on extrusion dies. (04 Marks)
 - c. It is required to extrude an Aluminium alloy at 380⁰C through square dies from 140mm to 50mm diameter. The ram speed is 40mm/sec and the flow stress of the material at 380⁰C is 240MPa. Determine the extrusion force with the following data. Length of the billet is 450mm , Semi – die angle is 45⁰ : Coefficient of friction between work surface is 0.15. (08 Marks)

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- 7 a. Explain the types of multi operation dies, with neat sketches. (12 Marks)
b. Calculate the maximum punch force and the work done required to blank a steel washer 44.45mm outside dia and 22.3mm inside dia from a 1.59mm thick rectangular sheet with an ultimate shear stress of 432N/mm^2 and the % penetration is 20%. (08 Marks)
- 8 a. Discuss any 3 methods of production of powders. (06 Marks)
b. List the advantages and disadvantages of HERF. (08 Marks)
c. Explain : i) Electromagnetic forming ii) Hot Isostatic Pressing. (06 Marks)

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Fifth Semester B.E. Degree Examination, Dec.2013/Jan.2014

Manufacturing Process – III

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. How the metal working processes are classified? Explain. (06 Marks)
- b. Define re-crystallization. Distinguish hot working from cold working. (06 Marks)
- c. Derive an expression for the following with respect to yield criteria for ductile material:
 - i) Von-Mises or distortion energy criteria
 - ii) Tresca or maximum shear stress criteria. (08 Marks)
- 2 Explain the following parameters which affects the metal working processes:
 - a. Temperature
 - b. Strain rate effects
 - c. Hydrostatic pressure
 - d. Deformation zone geometry (20 Marks)
- 3 a. Explain with sketch the procedural steps involved in forging operation. (06 Marks)
- b. A solid cylindrical slug made of stainless steel is 150 mm diameter and 100 mm height. It is reduced in height by 50% at room temperature by open die forging with flat dies. Assume μ as 0.2 and flow stress as 1000 MPa, calculate forging force at the end of the stroke.(06 Marks)
- c. Derive an expression for slab analysis to determine the mean pressure for closed die forging. (08 Marks)
- 4 a. Explain with sketch any three types of rolling mills. (09 Marks)
- b. Derive an expression to determine the roll force and power required in rolling operation. (06 Marks)
- c. Determine the maximum possible reduction for cold rolling a 300 mm slab when μ is 0.08 and the roll diameter is 600 mm. What is the maximum reduction on the same mill for hot rolling when μ is 0.5? (05 Marks)

PART – B

- 5 a. Explain with sketch the wire drawing and rod drawing operations. (08 Marks)
- b. Determine the drawing stress to produce 20% reduction in a 10 mm stainless steel wire. The mean flow stress $\bar{\sigma}$ is given as 637 MPa. The die angle is 12° and the μ is 0.09. Also determine the power required to draw when the wire is moving through the die at 3m/sec. (06 Marks)
- c. Explain with sketch any two methods of tube drawing. (06 Marks)
- 6 a. Explain with sketch the direct extrusion and indirect extrusion processes. (06 Marks)
- b. Explain with sketch the following extrusion processes:
 - i) Cold extrusion
 - ii) Hydrostatic extrusion and
 - iii) Impact extrusion (09 Marks)
- c. Explain in detail the deformation, lubrication and defects in extrusion. (05 Marks)
- 7 a. Explain with sketch the progressive die and combination die in sheet metal forming.(06 Marks)
- b. Explain with sketch the following operations in sheet metal forming:
 - i) Deep drawing
 - ii) Stretch forming
 - iii) Rubber press forming (09 Marks)
- c. Mention defects in sheet metal formed parts. (05 Marks)
- 8 a. Explain with sketch the following high energy rate forming methods:
 - i) Explosive forming; ii) Electro hydraulic forming; iii) Electromagnetic forming. (12 Marks)
- b. Explain different steps in powder metallurgy process. (08 Marks)

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10ME55

Fifth Semester B.E. Degree Examination, June/July 2013

Manufacturing Process - III

Time: 3 hrs.

Max. Marks: 100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. How are metal forming processes classified? Explain with sketches. (08 Marks)
 b. Explain Tresca and Von-Mises criteria. (06 Marks)
 c. Discuss the plane stress and plane strain concepts. (06 Marks)
- 2 a. Explain the effects of following parameters in metal working processes:
 i) Temperature ii) Strain rate iii) Friction and lubrication (10 Marks)
 b. Comment on: i) Deformation zone geometry, (10 Marks)
 ii) Residual stresses in wrought products.
- 3 a. Derive an expression for forging pressure and load acting in plane strain considering Coulomb's friction at the interface. (08 Marks)
 b. List and explain die design parameters in forging. (06 Marks)
 c. Briefly explain forging defects and residual stresses in forging. (06 Marks)
- 4 a. Sketch and explain different types of rolling mills. (06 Marks)
 b. Discuss maximum possible reduction in rolling process. (04 Marks)
 c. A steel sheet is hot rolled 30% from a 40 mm thick slab using 900 mm diameter roll. The slab is 760 mm wide. The plane flow stress is 140 MPa at entrance and 200 MPa at the exit from the roll gap due to the increasing velocity. Assume $\mu = 0.30$. Calculate:
 i) Rolling load
 ii) Rolling load with sticking friction. (10 Marks)

PART – B

- 5 a. Derive an expression for drawing load by slab analysis. (08 Marks)
 b. Explain optimal cone angle and dead zone formation in drawing. (06 Marks)
 c. Sketch and explain tube drawing process. (06 Marks)
- 6 a. Write a note on extrusion equipment, die design and lubrication. (08 Marks)
 b. Sketch and explain extrusion of seamless tubes. (08 Marks)
 c. Discuss extrusion variables. (04 Marks)
- 7 a. Explain with figures working of progressive and compound die arrangements in sheet metal working. (10 Marks)
 b. With sketches, explain the operations: i) Rubber forming, ii) Deep drawing. (10 Marks)
- 8 a. With a neat figure, explain the following forming methods:
 i) Explosive forming
 ii) Electromagnetic forming (10 Marks)
 b. Discuss with flow chart powder metallurgy process. (10 Marks)

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