III B.Tech II Semester Supplementary Examinations,
November/December 2005
METAL FORMING
(Production Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain the terms:
   (a) "True Stress" and "True Strain". How they differ from the concepts of Engg. Stress and Engg. Strain
   (b) Discuss the relationships between
      i. True stress and Engineering stress
      ii. True strain and Engineering strain
2. (a) Differentiate between Hot working and Cold working operations. Mention their advantages, limitations and applications.
   (b) Discuss the various requirements of materials to be cold worked ? Name few metals to be cold worked ? Explain how this process is suitable for close dimensional tolerances.
3. (a) Explain the process of bending operation? Discuss various types of bending with neat sketches.
   (b) How can spring back be offset? Explain the factors influencing spring back. What is its application and relative merits.
4. (a) Sketch and explain the working of a Compound die. Indicate various elements in it.
   (b) Sketch and explain the constructional details of Hydraulic press and mention its salient features.
5. (a) Describe a basic extrusion process and indicate elements in it Sketch some typical cross-sections that are extruded.
   (b) Discuss the effect of process variables in drawing and extrusion.
6. (a) Estimate the maximum force required for extruding a cylindrical aluminium billet of 50 mm diameter and 75 mm length to a final diameter of 10 mm. The average tensile yield stress for aluminium is $170N/mm^2$. What percent of the total power input will be lost in Friction at the start of operation?
   (b) Discuss the principle and operation of Tube piercing with a neat sketch.
7. (a) How the size of a forging machine specified? Why the position of parting line is so important in forging? Compare single impression dies and multi-impression dies.

(b) In what way the Blocking and Finishing impressions differ in a Forging operation. What are the advantages and limitations of Upset Forging.

8. (a) Differentiate between Three high rolling mill and Four high rolling mill. Mention their relative advantages and limitations.

(b) How the Friction affects a rolling process? What methods generally adopted in reducing it.

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Code No: RR322002 **Set No. 2**

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   (b) Discuss the various requirements of materials to be cold worked ? Name few metals to be cold worked ? Explain how this process is suitable for close dimensional tolerances.
3. (a) Explain the process of bending operation? Discuss various types of bending with neat sketches.
   (b) How can spring back be offset? Explain the factors influencing spring back. What is its application and relative merits.
4. (a) What is meant by "Throat Depth" of a press? A 200 KN Triple action Hydraulic press is used to punch Hexagonal blanks of 25 mm side having a shear of 2 mm and 50% penetration. Calculate the necessary blanking force?
   (b) Differentiate between Structural components and Guiding components of a press? Discuss the tonnage capacity of Mechanical and Hydraulic presses?
5. (a) How do you analyse an extrusion process through a conical die. Determine total extrusion pressure.
   (b) Derive an equation for power loss in extrusion.
6. (a) What are the defects generally found in extruded components? Mention the reasons and methods of elimination of these defects?
   (b) Derive an equation for the force required in Wire Drawing process.
7. (a) Sketch and describe the various sequence of operations in forging of an automobile connecting rod.

(b) Discuss various forging defects mentioning reasons and remedies. Suggest suitable methods of reducing them in forged components?

8. (a) Discuss the following terms with regard to Rolling.
   i. Power Rating of Mill Motors
   ii. Non-Uniform deformation

   (b) What are the main parameters of Rolling process? How the Billets and Blooms are manufactured?

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Code No: RR322002 **Set No. 3**

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Answer any FIVE Questions
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1. (a) Discuss the concept of 'Super plasticity' and the requirements to be fulfilled to achieve superplasticity. Name few superplastic materials.
   (b) Obtain the neat sketch of an Engineering stress-strain diagram for Aluminium and indicate various salient points.
2. (a) List out major kinds of imperfections in metals. Describe them.
   (b) Why cannot some metals such as Lead become stronger when cold worked? Give reasons.
3. (a) Explain the process of bending operation? Discuss various types of bending with neat sketches.
   (b) How can spring back be offset? Explain the factors influencing spring back. What is its application and relative merits.
4. (a) Sketch and explain the working of progressive die. Indicate various elements on it.
   (b) Sketch a single die used in sheet metal working. How do you select clearances between punch and die. Explain in detail.
5. (a) An aluminium alloy is hot extruded at 400^0C at 50 mm S^{-1} from 150 mm diameter to 50 mm diameter. The flow stress at this temperature is given by $\overline{\sigma} = 200\,(\varepsilon)^{0.15}\ Mpa$. If the billet is 380 mm long and the extrusion is done through square dies without Lubrication, determine force required for the operation.
   (b) Why Lubrication is essential in Drawing Operation? Differentiate between Wet Drawing and Dry Drawing.
6. (a) Sketch and describe the construction and working of hydrostatic extrusion and mention some of its applications and advantages.
   (b) Discuss the effects of deformation speeds, lubricants and different die materials in hot and cold working processes.
7. (a) Determine the forging load at the start and completion of hot forging of a steel billet for the following data:
   Billet Size:
   Length = 2 metres

Width = 0.8 mts
Thickness = 0.2 mts
Tool bite = 0.3 mts
Yield stress = 50 Mpa at start = 150 Mpa at completion of forging Reduction in forging = 50%.

(b) Discuss Orbital Forging with a neat sketch. Mention its relative merits and applications?

8. (a) Discuss the principles of Roll Pass Design Process. Explain its role for producing various sections?

(b) Sketch and explain the different types of rolls that are used in Rolling operation? How do you protect wear of rolls?

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1. (a) Distinguish between engineering stress strain diagram and true stress strain diagram. How they relate to each other.
   (b) Details of a specimen subjected to tensile test are given below:
   Initial diameter = 12 mm
   Gauge Length = 50 mm
   Maximum Load = 90 KN
   Fracture Load = 70 KN
   Diameter at Fracture = 10 mm
   Calculate
      i. True Fracture stress
      ii. Engineering stress at maximum load
      iii. True strain at Fracture
      iv. Engineering strain at fracture
2. (a) Describe the concept of 'Work Hardening' process. In what way it will be helpful for metal deformation.
   (b) Explain the following terms:
      i. Recovery
      ii. Recrystallization
      iii. Grain growth
      iv. Strain Hardening
3. (a) Explain the process of bending operation? Discuss various types of bending with neat sketches.
   (b) How can spring back be offset? Explain the factors influencing spring back. What is its application and relative merits.
4. (a) Explain the working of a 'Combination Die' with a neat sketch. Indicate various elements in it.
   (b) How a combination die can be compared with a transfer die. Explain the merits and demerits of both.
5. (a) Derive an equation to calculate Extrusion Load.
   (b) Discuss the common methods of extrusion processes with sketches.

6. (a) Differentiate between 'Surface Cracking' and Internal Cracking of the extruded product. How they can be explained? Mention methods of eliminating them.
   (b) Name the important process variables in the drawing of rod and wire. Discuss briefly.

7. (a) How the size of a forging hammer is specified ? Name the main parts of a hammer. Describe the common types of forging hammers?
   (b) How we achieve the stock size required for forging?
   (c) On what factors, dimensions of forging die block depend ? Specify dimensions of die block for single and multi-impression dies.

8. (a) A wide strip is rolled to a final thickness of 6.35 mm with a reduction of 30
   (b) Discuss the following terms in a Rolling Operation:
      i. Angle of Bite
      ii. Specific Roll pressure
      iii. Neutral plane
      iv. Backward slip.

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