

**III B.Tech II Semester Regular Examinations, Apr/May 2006**  
**METAL FORMING**  
**(Production Engineering)**

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions  
All Questions carry equal marks

\*\*\*\*\*

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 [8+8]
2. (a) Describe 'dislocation' theory. How a Burger's Vector is generally used in dislocation. How is displacement expressed by it ?  
(b) Derive an expression for 'Critical Resolved shear stress'. [8+8]
3. (a) Describe the method of calculating cutting (shearing)/force in blanking and punching.  
(b) Explain the concept of Bending pressure. List out the Die-opening factors for U-Bending and V-Bending. Why 'Bottoming force' is needed in Bending operation. Explain where it is provided. [8+8]
4. (a) What are the factors that influence selection of a press.  
(b) Classify different presses for sheet working of metals. Discuss their principle and specific applications.  
(c) What are the advantages of Mechanical press over Hydraulic Press. [4+7+5]
5. (a) Describe a basic extrusion process and indicate elements in it. Sketch some typical cross-sections that are extruded.  
(b) Discuss the effects of deformation speed, die materials and lubricants in hot and cold working processes. [8+8]
6. (a) How do you analyse the wire drawing operation. Explain the functions of die angle in Wire Drawing.

- (b) Discuss briefly about Extrusion die materials. How do you differentiate between Hydrostatic extrusion and Impact extrusion? [8+8]
7. (a) Derive an expression for forging load while forging a circular disc. List out various assumptions made in it.
- (b) Discuss various types of forgeability tests and their suitable application in metal forming. [8+8]
8. (a) Explain the different sequence of operations involved in rolling of Channel type sections. Discuss with sketches.
- (b) Describe a Four High Rolling Mill with a neat sketch. How do you utilise this mill for different shapes. Sketch various shapes that are produced by it.[8+8]

★ ★ ★ ★ ★

**III B.Tech II Semester Regular Examinations, Apr/May 2006**  
**METAL FORMING**  
**(Production Engineering)**

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions  
All Questions carry equal marks

\*\*\*\*\*

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 [8+8]
2. (a) What effects does recrystallization have on properties of metals ? Describe in detail?
- (b) Determine the slip systems for slip on a (111) plane in a FCC crystal and sketch the result and explain. [8+8]
3. (a) Define ‘Bending’. Sketch the nomenclature of a bent part of the specimen. Indicate various elements in it. Differentiate between Bend angle, Bend radius and Bend allowance. Explain each element briefly.
- (b) A 38 cms long, 19 mm wide and 2.5 mm thick strip is tube bent in a V-shaped die. Calculate the bending force necessary if the steel has  $630N/mm^2$  tensile strength. Also what type of punch and die used for this purpose? [8+8]
4. (a) Sketch a Knuckle joint press with details and indicate the elements.
- (b) List out different presses that are classified on number of drive gears. Briefly explain. In what way the capacity of hydraulic press can be specified. How it can be varied ? [8+8]
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. [8+8]
6. (a) Analyse the Tube Drawing operation. Mention necessary assumptions. Explain the functions of die angle in Tube drawing.
- (b) Discuss maximum possible reduction in Tube Drawing operation. [8+8]
7. (a) Derive an expression for forging load while forging a circular disc. List out various assumptions made in it.
- (b) Discuss various types of forgeability tests and their suitable application in metal forming. [8+8]

8. (a) Explain the effect of 'Back Tension' on Rolling process. Discuss its application with the help of 'Friction Hill'. How the 'forward' and 'backward slips' will be explained and its role in Rolling?
- (b) Calculate rolling load if steel sheet is hot rolled to 30% from thick slab using 800 mm dia roll. Slab is 40 mm wide. Assume coefficient of friction is 0.3. Plain strain flow stress is  $138\text{N/mm}^2$  at entrance and  $270\text{N/mm}^2$  at exit. In the above problem, what would be load if the sticking Friction occurs? [8+8]

★ ★ ★ ★ ★

**III B.Tech II Semester Regular Examinations, Apr/May 2006**  
**METAL FORMING**  
**(Production Engineering)**

**Time: 3 hours**

**Max Marks: 80**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

\*\*\*\*\*

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 [8+8]
2. (a) Discuss the concept of ‘Strain Aging’. Explain its effect in flow curve of a low carbon steel with a sketch.  
(b) Define the following:
  - i. Dislocation climb
  - ii. Cross slip
  - iii. Jogs in dislocation
  - iv. Perfect and partial dislocation [8+8]
3. (a) Distinguish between ‘Embossing’ and ‘Coining’. How these operation are used to produce various components? How it differs from other forming operations?  
(b) Explain the detailed mechanics of Deep Drawing. How it differs from Shallow drawing? [8+8]
4. (a) Sketch and explain the working of a transfer die used in practice. Explain various elements used for it.  
(b) Differentiate between Compound, Combination and Progressive dies. [8+8]
5. (a) What is drawing ? What type of components can be made by drawing operation ? Discuss the factors affecting drawing.  
(b) A shell has an outside diameter of 60 mm and is made from mild steel of 3 mm thick. Calculate dimensions of punch and die. [8+8]
6. (a) Discuss the effects of friction and lubrication in Tube Drawing and Deep Drawing operations.  
(b) Discuss the various defects that are found in Deep Drawing and compare with defects in extruded products. [8+8]
7. (a) Derive an expression for forging load while forging a circular disc. List out various assumptions made in it.

- (b) Discuss various types of forgeability tests and their suitable application in metal forming. [8+8]
8. (a) Explain the process of Hot Rolling. How do you roll, plates and strips?
- (b) A steel plate 20 mm thick is to be rolled to 14 mm in a four high rolling mill having roll diameter 500 mm. If yield stress is  $12Kg/mm^2$ , determine maximum roll pressure? [8+8]

\*\*\*\*\*

**III B.Tech II Semester Regular Examinations, Apr/May 2006**  
**METAL FORMING**  
**(Production Engineering)**

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

**Answer any FIVE Questions**  
**All Questions carry equal marks**

\*\*\*\*\*

1. (a) Define the terms:
  - i. True stress at Maximum Load
  - ii. True Fracture Stress
  - iii. True Fracture strain
  - iv. True uniform strain(b) In the tension test of a metal fracture occurs at maximum load. The conditions at fracture were:  
Final Area,  $A_f = 100mm^2$   
Final Length  $L_f = 60mm$   
Initial Length  $L_0 = 40mm$   
Initial Area  $A_0 = 150mm^2$   
Determine the true strain to fracture using changes in both length and area.  
[8+8]
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[8+8]
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.  
[8+8]
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.  
[8+8]
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.  
[8+8]

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. [8+8]
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+8]
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. [8+8]

\*\*\*\*\*