

III B.Tech II Semester Supplementary Examinations, Apr/May 2008
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
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) Discuss in detail about the process parameters and estimation of loads in Deep Drawing.
(b) Discuss the following briefly with sketches.
 - i. Trimming dies and Bending dies
 - ii. Punching, and Fine Blanking.
4. (a) Discuss 'Rating' of a press ? What are the various requirements of Press tool design. How do you calculate 'percentage utilization of material' in press working.
(b) What are the various materials used in Diesets. Explain each for specific application. Explain the functions of each in a press working dieset.
 - i. Backup plate
 - ii. Knock out
 - iii. Stripper
 - iv. Bolster plate.
5. (a) Discuss the reasons and remedies for defects in drawing.
(b) Explain the process of Tube extrusion? How the Seamless tubes are manufactured?
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.

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) Differentiate between Two high Reversing Mill and Three High Mill. Sketch them.
- (b) Discuss the various stages of Shape Rolling of a component with sketches? What are its applications? [8+8]

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 - (b) Discuss the relationships between
 - i. True stress and Engineering stress
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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. [8+8]
3. (a) What is meant by 'Percentage Penetration' ? How this quantity employed for designing tools in press work?
(b) Sketch the various methods of applying shear to punch and die? [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) Discuss the effect of friction and redundant work components on drawing stress ?
(b) Describe Impact extrusion process with a neat sketch. Name different parts made by this process. What type of lubricants are useful to carry out this process. [8+8]
6. (a) In a wire drawing operation, determine the drawing stress and total drawing load using following data:
Initial wire diameter = 6 mm
Final wire diameter = 3.2 mm
Die angle = 18°
Die land = 4mm
Coefficient of friction = 0.15
Yield stress = $26Kg/mm^2$.
(b) Indicate the composition of Extrusion die materials. Describe the causes of defects that occur in Wire Drawing. [8+8]

7. (a) A Metal component $30 \times 36 \times 160\text{mm}$ having a yield stress of 0.9kg/mm^2 is to be pressed between flat dies to a size $8 \times 100 \times 160\text{mm}$. If $\mu = 0.26$, Calculate the following:
- i. Pressure at the centre
 - ii. Pressure at the edges
 - iii. Total Forging Load.
- Plot the pressure distribution variation.
- (b) Derive an equation for Forging load in case of cylindrical slug. List out various assumptions made in it. [8+8]
8. Write short notes on the following:
- (a) Types of Roll materials
 - (b) Process parameters in Rolling
 - (c) Defects in Rolling and their remedies
 - (d) Rolling Mills [16]

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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. [8+8]
3.
 - (a) A steel washer of 28 mm outer diameter and 20 mm inside diameter is to be made from 1.3 mm thick sheet. If the shear stress of the material is 380N/mm^2 . Calculate:
 - i. Force required to produce washer if both punches operate at the same time with no shear. What will be stripping force?
 - ii. Force required if only one punch operates at a time (i.e. punches are staggered)?
 - (b) Discuss the design principles of the following:
 - i. Punch length
 - ii. Punch plate
 - iii. Punch Holder. [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) Discuss the effect of friction and redundant work components on drawing stress ?
 - (b) Describe Impact extrusion process with a neat sketch. Name different parts made by this process. What type of lubricants are useful to carry out this process. [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) 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. [8+8]

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2. (a) What effects does recrystallization have on properties of metals ? Discuss in detail.
(b) Describe your understanding of why different crystal structures exhibit different strengths and ductilities. [8+8]
3. (a) A hole of 60 mm diameter is to be produced in steel plate of 3 mm thick. The ultimate shear strength of the plate material is 450N/mm^2 . If the punching force is to be reduced to half of the force using a punch without shear, estimate the amount of shear on the punch. Take percentage penetration as 40%.
(b) How the Manual 'spinning' differs from Power 'spinning'. Explain their relative merits and applications. [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) Distinguish between extrusion, drawing and forging ? Compare their relative merits. How does extrusion pressure varies with Ram travel?
(b) A shell is to have its wall thickness reduced from 1.8 mm by 11%. The new shell will have a new diameter of 40 mm.
Determine:
 - i. Mean Height of the shell
 - ii. Shell diameter needed to draw the ironed shell. [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) Describe the process of Press Forging with a neat Sketch. Enumerate the merits and demerits of Forging.
(b) List out different forging operations. Discuss in detail. [8+8]
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? [8+8]
