Adda247

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TO Adda247

"There is nothing impossible to they who will try."

ISRO | BHEL | DRDO & OTHER PSUs

PRODUCTION

METAL FORMING

MOST EXPECTED QUESTIONS

Live@ 11:30Am

PART-1

Gaurav sir

GATE-2023
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GATE
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AIR 392 EE GAURAV MAHAJAN
AIR 403 EC MOHAN KUMAR SINGH
AIR 567 EE SHANKAR JHA
AIR 571 ME VIJENDER MEENA

YouTube Classes Schedule

ENGINEERS

MECHANICAL ENGINEERING

EXAM TARGET	SUBJECT	TIME	FACULTY
ALL PSUs	ENGINEERING MATHS	10:00 AM	ANANT SIR
ALL PSUs	PRODUCTION	11:30 PM	GAURAV SIR
ALL PSUs	THERMODYNAMICS	3:00 PM	KANISTH SIR
GATE 2024-25	HMT	4:30 PM	YOGESH SIR
GATE 2024-25	SOM	9:00 PM	MUKESH SIR

FREE APP CLASS SCHEDULE

MECHANICAL ENGINEERING

GATE

HMT	MONDAY Live @11AM	YOGESH SIR
PRODUCTION	TUESDAY Live @11AM	GAURAV SIR
SOM	WEDNESDAY Live @8PM	MUKESH SIR
THERMODYNAMICS	THURSDAY Live @11AM	KANISTH SIR
ENGINEERING MATHEMATICS	FRIDAY Live @11AM	ANANT SIR

* Tworking < RcT → cold working

* Tworking ≥ RcT → Hot working

* Tworking ≃ RcT → worm working

The recrystallization behaviour of a particular metal alloy is specified in terms of recrystallization temperature, which is typically 1/3rd of the absolute melting temperature of a metal or an alloy and depends on several factors including the amount of

1. cold working and purity of the metal and alloy
2. hot working and purity of the metal and alloy

Which of the above is/are correct?

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

Assertion (A): Lead, Zinc and Tin are always hot worked.

Reason (R) : If they are worked in cold state they cannot retain their mechanical properties.

(a) Both A and R are individually true and R is the correct explanation of A

(b) Both A and R are individually true but R is NOT the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

* Lead, Tin → RCT below Room Temp

* zinc, cadmium → RCT equal to Room temp

Lead, Tin, Zinc, Cadmium

⇓

"Hot working"

Hot rolling of mild steel is carried out

(a) At recrystallisation temperature

(b) Between 100°C to 150°C

(c) Below recrystallisation temperature

(d) Above recrystallisation temperature

Rolling

⇓

Hot Rolling

⇓

$T_{working} > T_{RCT}$

RCT → $\left(\frac{1}{3} \text{ to } \frac{1}{2}\right)$ M.P

Annealing

⇓

* Stress Relieve
* Ductility ↑

Formability / Merrability ↑

Materials after cold working are subjected to following process to relieve stresses

(a) Hot working

(b) Tempering

(c) Normalizing

(d) Annealing ✓

Cold working

⇓

Strain Hardening

⇓

* Strength And Hardness ↑
* Ductility ↓
* Toughness ↓

Consider the following statements:

In comparison to hot working, in cold working,

1. Higher forces are required
2. No heating is required
3. Less ductility is required
4. Better surface finish is obtained

Which of the statements given above are correct?

(a) 1, 2 and 3
(b) 1, 2 and 4
(c) 1 and 3
(d) 2, 3 and 4

Consider the following characteristics:

1. Porosity in the metal is largely eliminated.
2. Strength is decreased.
3. Close tolerances cannot be maintained.

Which of the above characteristics of hot working is/are correct?

(a) 1 only (b) 3 only

(c) 2 and 3 (d) 1 and 3

1, 2, 3

Cold working produces the following effects:

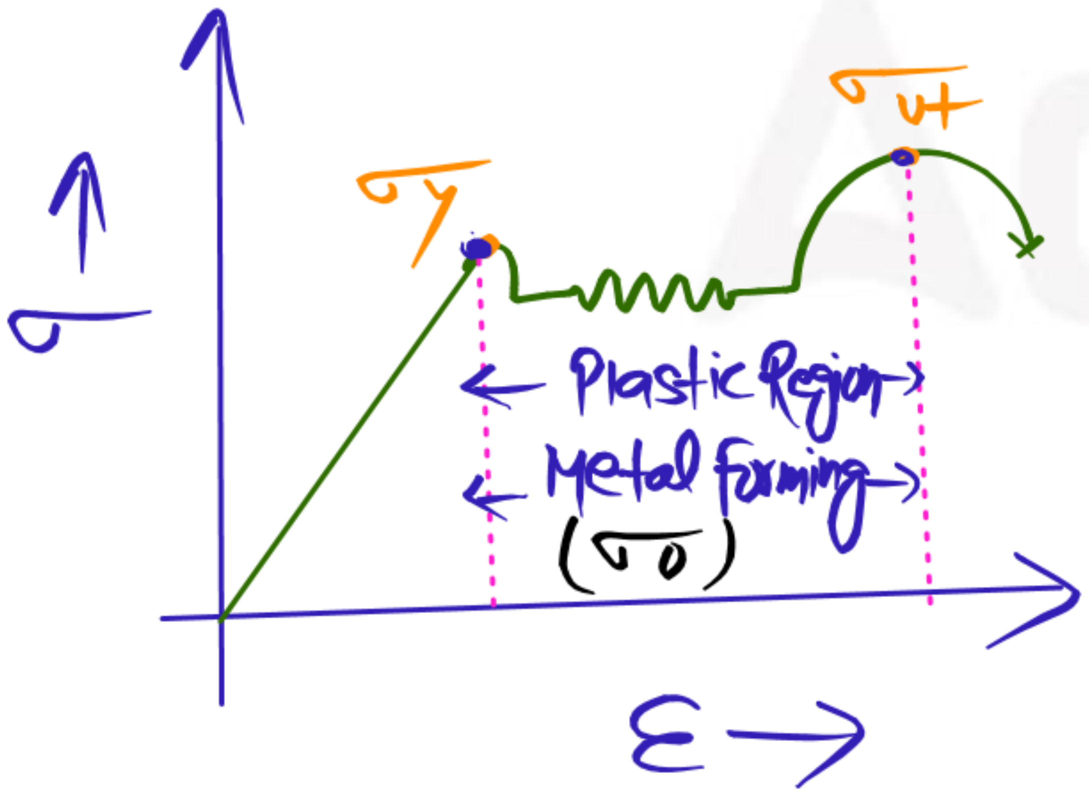
1. Stresses are set up in the metal
2. Grain structure gets distorted
3. Strength and hardness of the metal are decreased
4. Surface finish is reduced

Which of these statements are correct?

(a) 1and 2 (b) 1, 2 and 3

(c) 3 and 4 (d) 1 and 4

Metal Forming
⇓
Plastic Deformation
⇓
(Ductile Material)



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In the metal forming process, the stresses encountered are

(a) Greater than yield strength but less than ultimate strength

(b) Less than yield strength of the material

(c) Greater than the ultimate strength of the material

(d) Less than the elastic limit

Flow stress = σ_0

* $\sigma_y < \sigma_0 < \sigma_{ut}$

Specify the sequence correctly

(a) Grain growth, recrystallisation, stress relief

(b) Stress relief, grain growth, recrystallisation

(c) Stress relief, recrystallisation, grain growth

(d) Grain growth, stress relief, recrystallisation

For mild steel, the hot forging temperature range is

(a) 400°C to 600°C

(b) 700°C to 900°C

(c) 1000°C to 1200°C

(d) 1300°Cto 1500°C

Rolling
⇓
Hot Rolling

Consider the following characteristics of rolling process:

1. Shows work hardening effect
2. Surface finish is not good
3. Heavy reduction in areas can be obtained

Which of these characteristics are associated with hot rolling?

(a) 1 and 2 (b) 1 and 3
(c) 2 and 3 (d) 1, 2 and 3

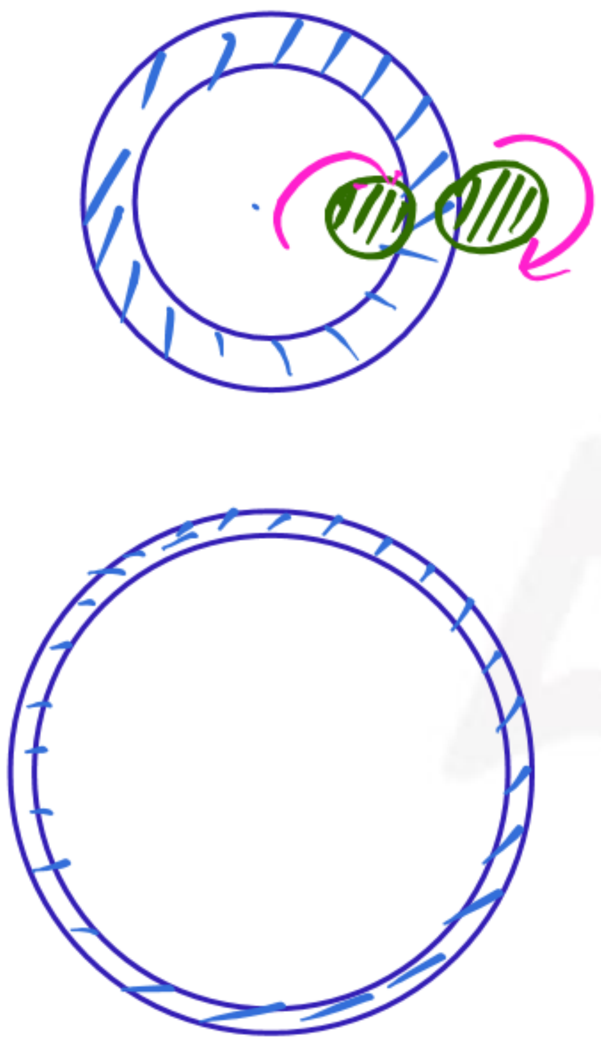
Which of the following processes would produce strongest components?

(a) Hot rolling → (S&H)↓

(b) Extrusion

(c) Cold rolling → (S&H)↑

(d) Forging → Hot Forging → (S&H)↓



Ring rolling is used

(a) To decrease the thickness and increase diameter

(b) To increase the thickness of a ring

(c) For producing a seamless tube

(d) For producing large cylinder

Which one of the following is a continuous bending process in which opposing rolls are used to produce long sections of formed shapes from coil or strip stock?

(a) Stretch forming (b) Roll forming

(c) Roll bending (d) Spinning

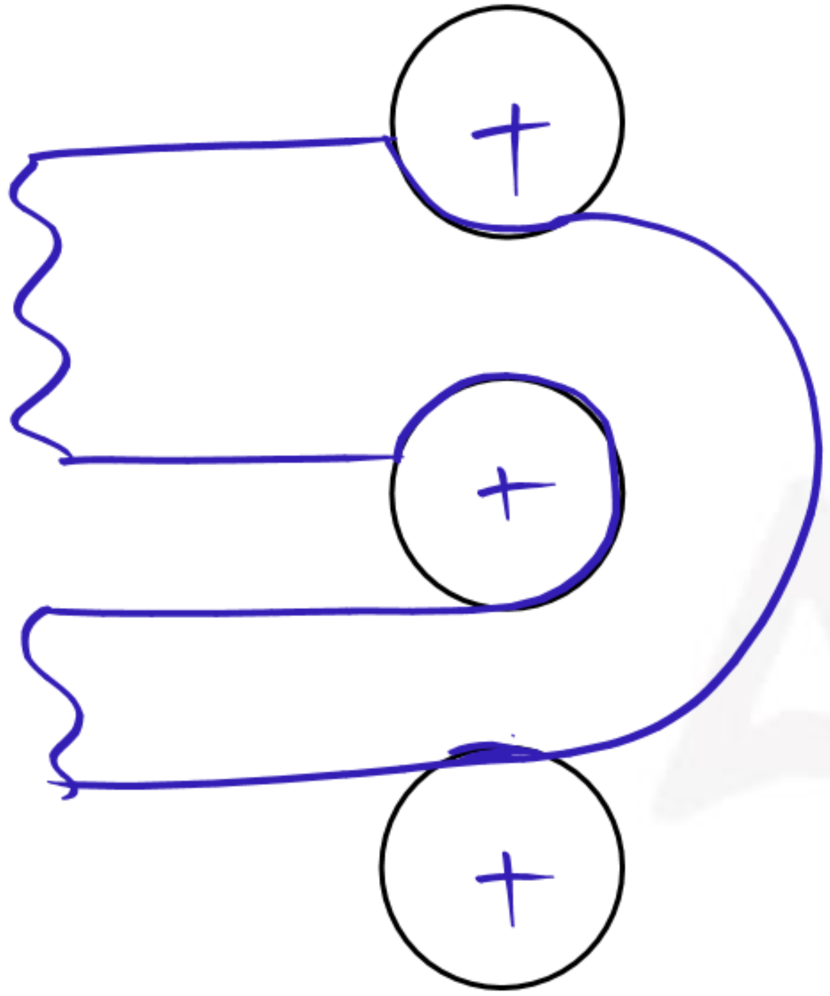
Thread rolling is restricted to

(a) Ferrous materials

(b) Ductile materials

(c) Hard materials

(d) None of the above



In one setting of rolls in a 3-high rolling mill, one gets

(a) One reduction in thickness

(b) Two reductions in thickness ✓

(c) Three reductions in thickness

(d) Two or three reductions in thickness depending upon the setting

* 2-High Roll - 1
* 3-High Roll → 2 Reduction
* 4-High Roll → 1

Given Data :→

* $A_0 = 150mm \times 4.5 mm$
* 20% Reduction of Area
* $D = 450mm$
* $\alpha = ?$ (Radian)

A strip with a cross-section 150 mm x 4.5 mm is being rolled with 20% reduction of area using 450 mm diameter rolls. The angle subtended by the deformation zone at the roll centre is (in radian)

(a) 0.01 (b) 0.02

(c) 0.03 (d) 0.06 ✓

Solution :→

b × h

* $A_0 = 150\,mm \times 4.5\,mm$

* $h_0 = 4.5\,mm$

* $h_f = 0.80 \times 4.5 = 3.6\,mm$

☺ $\Delta h = D(1 - \cos\alpha)$

* $(h_0 - h_f) = D(1 - \cos\alpha)$

* $4.5 - 3.6 = 450(1 - \cos\alpha)$

* $\alpha = 3.62^\circ \times \frac{\pi}{180} = 0.063$ Radian

☺ Rolling

⇓

Reduction in Thickness

⇓

width Remain constant

Given Data :→

* $h_0 = 25$ mm
* $h_f = 20$ mm
* $D = 600$ mm
* Roll strip length $(l_s) = ?$

In a rolling process, sheet of 25 mm thickness is rolled to 20 mm thickness. Roll is of diameter 600 mm and it rotates at 100 rpm. The roll strip contact length will be

(a) 5 mm (b) 39 mm ✓

(c) 78 mm (d) 120 mm

Solution :→

* $L_s = R \cdot \alpha = \sqrt{R \cdot \Delta h}$
* $L_s = \sqrt{R \cdot \Delta h} = \sqrt{(300 \times 5)} = 39$ mm

Roll strip length (L_s) $= R \cdot \alpha = \sqrt{R \cdot \Delta h}$

Radian

The maximum possible draft in cold rolling of sheet increases with the

(a) increase in coefficient of friction

(b) decrease in coefficient of friction

(c) decrease in roll radius

(d) increase in roll velocity

* Draft OR Reduction = $h_0 - h_f$

* $\Delta h = (h_0 - h_f)$

* $(\Delta h)_{max} = \mu^2 \cdot R$

* $h_0 - (h_f)_{min} = \mu^2 \cdot R$

In a rolling operation using rolls of diameter 500 mm, if a 25 mm thick plate cannot be reduced to less than 20 mm in one pass, the coefficient of friction between the roll and the plate is 0.141

Given Data :→

* $D = 500mm$
* $h_0 = 25mm$
* $(h_f)_{min} = 20mm$
* $\mu = ?$

Solution :→ $h_0 - (h_f)_{min} \Rightarrow (\Delta h)_{max}$

* $(\Delta h)_{max} = \mu^2 \cdot R$

* $5 = \mu^2 \times 250$
* $\mu = 0.141$

A 4 mm thick sheet is rolled with 300 mm diameter rolls to reduce thickness without any change in its width. The friction coefficient at the work-roll interface is 0.1. The minimum possible thickness of the sheet that can be produced in a single pass is

(a) 1.0 mm (b) 1.5 mm

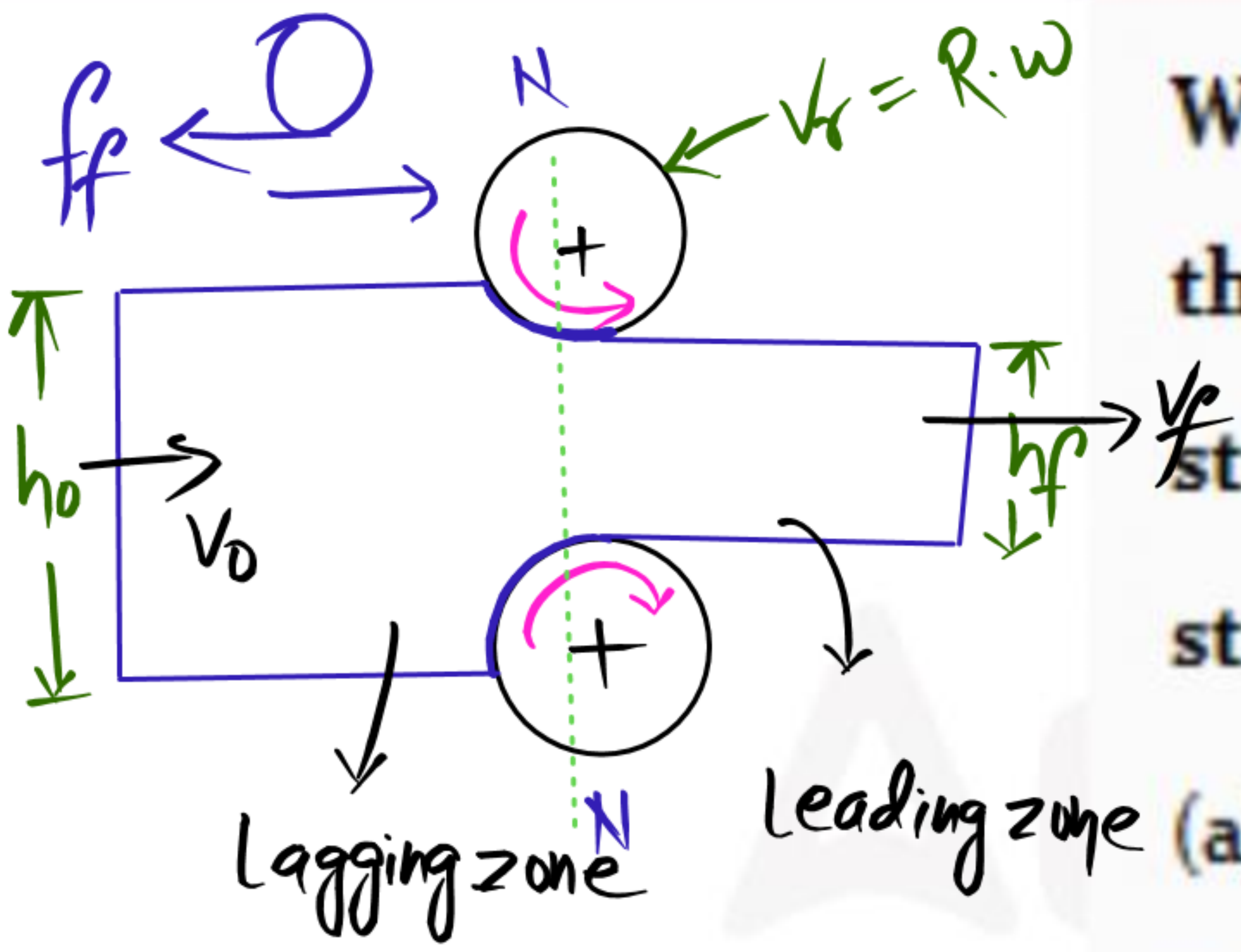
(c) 2.5 mm (d) 3.7 mm

Given Data :→

* $h_0 = 4\,mm$
* $D = 300\,mm$
* $(h_f)_{min} = ?$
* $\mu = 0.1$

Solution :→ $(\Delta h)_{max} = \mu^2 \cdot R$

* $h_0 - (h_f)_{min} = \mu^2 \cdot R$
* $4 - (h_f)_{min} = (0.1)^2 \times 150$
* $(h_f)_{min} = 2.5\,mm$



While rolling a strip the peripheral velocity of the roll is ....A.....than the entry velocity of the strip and is ......B .....the exit velocity of the strip.

(a) less than/greater less

(b) Greater than/less than

* $V_0 < V_r$
* $V_f > V_r$
* Backward Slip
* Forward Slip

* Neutral Point

⇓

* $V_0 = V_r = V_f$

⇓

Slip = 0

The effect of friction on the rolling mill is

(a) always bad since it retards exit of reduced metal

(b) always good since it drags metal into the gap between the rolls

(c) advantageous before the neutral point

(d) disadvantageous after the neutral point

In the rolling process, roll separating force can be decreased by

(a) Reducing the roll diameter

(b) Increasing the roll diameter

(c) Providing back-up rolls

(d) Increasing the friction between the rolls and the metal