

me270hw6 GDT

question

1

Question 1: Metrology - Datums

How many datums are present in this drawing?

The drawing shows a mechanical part with the following dimensions and features:

- Overall width: 60
- Distance from left face to center of hole: 33
- Distance from center of hole to right face of step: 17
- Overall height: 30
- Distance from top face to center of hole: 15
- Distance from bottom face to center of hole: 8
- Distance from center of hole to right face of step: 22
- Hole diameter: $\varnothing 20$

Three datums are identified in the drawing:

- Datum 1: The right vertical face of the part.
- Datum 2: The top horizontal face of the part.
- Datum 3: The bottom horizontal face of the part.

☐ 2
☐ 6
☒ 3
☐ 9
☐ 4
☐ 1
☐ 8
☐ 7
☐ 10
☐ 5

This question is complete and cannot be answered again.

How many datums are present in this drawing?

Answer

3

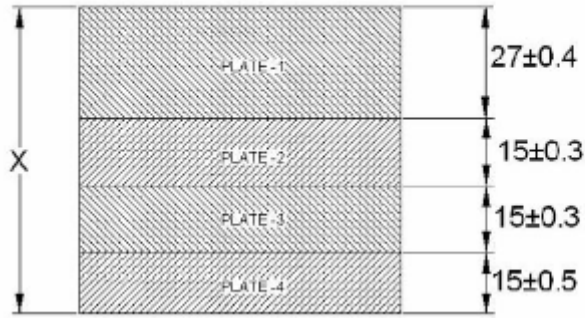
q2

What are the maximum and minimum possible values of x?

$$(27 \pm 0.4)(15 \pm 0.3)(15 \pm 0.3)(15 \pm 0.5)$$

$$\text{Max} = 73.5 \text{ // Minimum} = 70.5$$

What are the maximum and minimum possible values of x ?



Answer

73.5 70.5

q3

What is the MMC for a shaft with a nominal diameter of 3.2 ± 0.9 cm

ADD the two number

(MMC = diameter + (Biggest Shaft))

Answer

(MMC = diameter + (Biggest Shaft))

q4

What is the LMC for a hole with a nominal diameter of 3.9 ± 0.4 cm

ADD the two number

(LMC= diameter +) (Smallest hole)

Diameter = 4.3 cm

Answer

(LMC= diameter +) (Smallest hole)

q5

Question 5: GD&T Hole 10B

For this **hole**
what is the Inner Boundary (inside of this diameter is guaranteed to have a hole)
and Outer Boundary (outside of this diameter is guaranteed there is no hole)?

The diagram shows a front and side view of a part with a hole. The front view is a square with a circular hole in the center. The hole has a feature control frame with a circle, a diameter symbol, and the values 27.8 and 27.2. The side view shows the hole's depth. Callouts A, B, and C point to the hole's boundaries.

IB = OB =

For this hole what is the Inner Boundary (inside of this diameter is guaranteed to have a hole) and Outer Boundary (outside of this diameter is guaranteed there is no hole)?

hole size(48.6 / 48.2), with tolerance 0.3

IB = $48.2 - 0.3 = 47.9$ (MMC - Zone) (Area guaranteed to have hole = largest perfect pin that can mate)

OB = $48.6 + 0.3 + (48.6 - 48.2) = 49.3$ (LMC- Zone) (Area without a hole)

Python

Q21

a = 48.6 / hole size

b = 48.2 / hole size

c = 0.3 / tolerance

IB = 47.9 // OB = 49.3

e OB would be found by:

1. Identifying the larger hole(38.7)
2. Adding the .5
3. Take the difference between the larger and smaller holes
4. Add answer of 2 to answer of 3

q6

Question 6: GD&T Pin VC RC

For this pin
what is the Virtual Condition Boundary (outside of this diameter there is no pin)
and the Resultant Condition Boundary (inside of this diameter is guaranteed to have a pin)?

$\varnothing 66.5 \begin{smallmatrix} +0.5 \\ -0.5 \end{smallmatrix}$ A B C

VC = RC =

For this pin what is the Virtual Condition Boundary (outside of this diameter there is no pin) and the Resultant Condition Boundary (inside of this diameter is guaranteed to have a pin)?

pin size(66.5 / 66.2) with tolerance 0.5

VC = $66.5 + 0.5 = 67$ (MMC + Zone) (VC = area that is pin free = smallest perfect hole)

RC = $66.2 - 0.5 = 65.7 - (66.5 - 66.2) = 65.4$ (LMC - Zone) (RC = area guaranteed to have a pin)

Python

Q22

a = 66.5 / hole size

b = 66.2 / hole size

c = 0.5 / tolerance

VC = 67 // RC = 65.4

q7

Assuming a PIN has the below GD&T specification, what positional tolerance must it have if its actual diameter is 36.4?

Pin size (37.1 / 36) with tolerance 0.7

Python

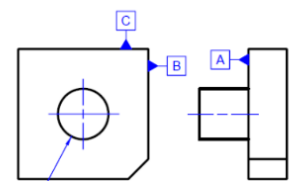
Q23

$$37.1 - 36.4 = 0.7$$

$$0.7 + \text{tolerance } (0.7) = 1.4$$

Question 7: GD&T Pin Tolerance

Assuming a PIN has the below GD&T specification, what positional tolerance must it have if its actual diameter is 33.1?



$\varnothing 33.6$
 $\varnothing 0.3$ A B C

Tolerance =

Save & Grade 5 attempts left Save only

2 points available for this attempt
(following attempts are worth: 2, 2, 1, 0.1)

q8

Assuming a Hole has the below GD&T specification, what positional tolerance should it have if its measured diameter is 28.2?

Hole size (29.1 / 28) with tolerance 0.6

Python

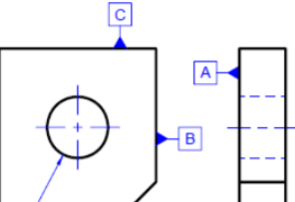
Q24

$$28 - 28.2 = 0.2$$

$$0.2 + \text{tolerance } (0.6) = 0.8$$

Question 8: GD&T Hole Tolerance

Assuming a Hole has the below GD&T specification, what positional tolerance should it have if its measured diameter is 27.5?



$\varnothing 28.3$
 $\varnothing 0.5$ A B C

Tolerance =

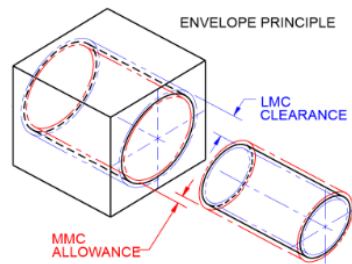
q9

Question 9: GD&T Minimum Clearance

Assuming a Pin and Hole have the below GD&T specifications, with diameters of 26.1 and 28.5 respectively?

What is the guaranteed minimum clearance between them?

Can you find a fairly simple and fast way to calculate this?



Pin: $\varnothing_{26.3}^{26}$

$\oplus \varnothing 0.9 \text{ M A B C}$

Hole: $\varnothing_{28.3}^{29.4}$

$\oplus \varnothing 0.1 \text{ M A B C}$

Minimum clearance =

Practice 6

Assessment

Question 9

Status:

Available points

Total points

Auto-graded

Report an error

Previous question

Personal

No attachments

Attach a file

Add text note

Assuming a Pin and Hole have the below GD&T specifications, with diameters of 26.1 and 28.5 respectively?

What is the guaranteed minimum clearance between them?

Can you find a fairly simple and fast way to calculate this?

Pin(29.1 / 28) tolerance 0.8

Hole (32.4/31.1) tolerance 0.6

Python

Q25

Minimum clearance = 0.6

Clearance = IB - VC

IB (Hole)= MMC - Tolerance

= 31.1 - 0.8 = 30.3

VC (Pin) = MMC + Tolerance

= 29.1 + 0.6 = 29.7

Clearance = 30.3 - 29.7 = 0.6

```
pin1=26.3
```

```
pin2=26
```

```
pt=0.9
```

```
hole1=29.4
```

```
hole2=28.3
```

```
ht=0.1
```

```
ibhole=hole2-ht
```

```
vcpin=pin1+pt
```

```
clearance=ibhole-vcpin
```

```
print(clearance)
```

10 Quality control is:

ensuring interchangeability

lowest cost

least variation

reducing tolerance

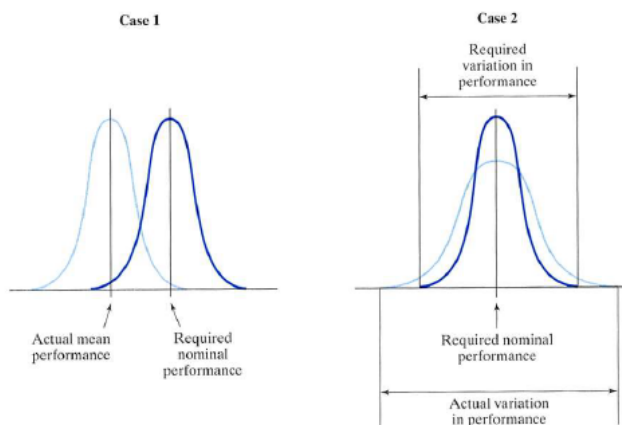
on-target

Answer

on-target

least variation

- **Case 1**强调了目标一致性（On-target），即过程的平均性能应尽可能接近所需标称性能。
- **Case 2**则强调了最小变异（Least variation），即过程的性能分布应尽可能紧密地围绕所需标称性能，以减少不合格品率。



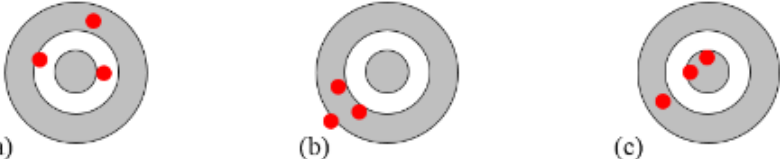
q11

Which dart thrower is the most precise

b

Question 11: Accuracy - Darts

Which dart thrower is the most precise



(a) (b) (c)

☐ a & c
☐ b & c
☐ a & b
☐ a
☐ b
☐ c

12 Stack Tolerance

Determine the tolerance of X, assuming each plate has either a uniform distribution or Gaussian distribution? (round answer to 2 decimal places)?

$$(27 \pm 0.4)(15 \pm 0.3)(15 \pm 0.3)(15 \pm 0.5)$$

Uniform tolerance = ± 1.5

Gaussian Tolerance = ± 0.768115

Uniform = add up all tolerance

$$\text{Gaussian} = ((x)^2 + (x_1)^2 + (x_2)^2 + \dots)^{1/2}$$

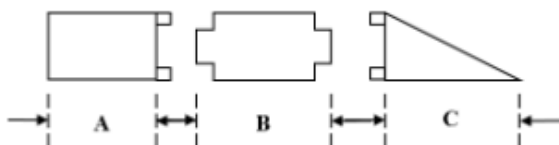
$$\text{Uniform tolerance} = \pm(0.4 + 0.3 + 0.3 + 0.5) = \pm 1.5 \text{ (tol 的和)}$$

$$\text{Gaussian tolerance} = \sqrt{0.4^2 + 0.3^2 + 0.3^2 + 0.5^2} = \sqrt{59}/10 \approx 0.76811457$$

13 Assembly Tolerance

Question 13: Assembly Tolerance

What is the total length of the below assembly including its tolerance? First determine assuming the part variation is uniformly distributed, and then assume a Gaussian distribution. **Since the length answer is given only to the tenths place, tolerance should also only go to tenths place. Tolerance answer X.X, not X.XX**



$$A = 3.7 \pm 0.7$$

$$B = 3.2 \pm 0.2$$

$$C = 3.2 \pm 0.2$$

$$\text{Uniform distribution length} = \boxed{} \pm \boxed{}$$

$$\text{Gaussian distribution length} = \boxed{} \pm \boxed{}$$

What is the total length of the below assembly including its tolerance? First determine assuming the part variation is uniformly distributed, and then assume a Gaussian distribution

$$A = 3.9 \pm 0.5$$

$$B = 3.5 \pm 0.3$$

$$C = 3.4 \pm 0.1$$

Python

Q26

$$\text{Uniform tolerance} = 10.8 \pm 0.9$$

$$\text{Gaussian Tolerance} = 10.8 \pm 0.6$$

Uniform = add up all tolerance

$$\text{Gaussian} = ((x)^2 + (x_1)^2 + (x_2)^2 + \dots)^{1/2}$$