ASME Y14.5M-1994 GD&T Certification Preparation Examination

Directions: On the response sheet on the last page, fill in the circle of the letter which best completes the following statements. Do not write on any pages other than the response sheet.

1. _____ is the term applied to a cylinder, or two opposed surfaces or points associated with a size dimension.
   a. Feature
   b. Feature of size
   c. Actual size
   d. Size dimension

2. _____ describe theoretically perfect sizes, profiles, orientations, or locations.
   a. Features of size
   b. True positions
   c. Nominal sizes
   d. Basic dimensions

3. A feature of size is said to be at _____ when it contains the maximum amount of material within stated limits.
   a. virtual condition
   b. maximum material condition
   c. maximum tolerance
   d. least material condition

4. A feature of size is said to be at _____ when it contains the minimum amount of material within stated limits.
   a. virtual condition
   b. maximum material condition
   c. minimum limit
   d. least material condition

5. _____ mm is the MMC limit of a hole of ∅ 15.0 ± 0.5.
   a. 14.5
   b. 15.25
   c. 15.5
   d. 16

6. Gaging tolerances should add _____ to the gaging feature.
   a. size
   b. bonus tolerance
   c. material
   d. importance

7. In general, the _____ modifier is used on tolerances for clearance fits, and _____ is used for press fits or centering.
   a. LMC/MMC
   b. RFS/MMC
   c. LMC/RFS
   d. MMC/RFS

8. Under the 1994 standard _____ is implied for all geometric tolerances and datum references unless another material condition is specified.
   a. MMC
   b. RFS
   c. LMC
   d. projected condition

9. Theoretically perfect planes, surfaces, points, lines, or axes from which measurements are made are referred to as _____.
   a. basic dimensions
   b. datum features
   c. datums
   d. simulated datums

10. A datum reference frame can be established by _____.
   a. three mutually perpendicular planes
   b. a plane and a perpendicular axis
   c. one or more degrees of freedom
   d. a. or b.

11. When a geometric tolerance or datum reference applies at all actual sizes within size limits, the term _____ is used.
   a. regardless of feature size
   b. limits of size
   c. virtual condition
   d. geometric tolerance

12. According to Rule #1, when form tolerances are in question _____ is required for features of size at MMC.
   a. true form
   b. perfect form
   c. geometric form
   d. true position

13. What is the straightness tolerance available for a ∅ .730 shaft with a specified size dimension of ∅ .725 ± .005?
   a. 0
   b. .001
   c. .005
   d. .010

14. _____ controls the form and/or orientation of straight lines, multiple planar surfaces, arcs, and irregular surfaces.
   a. Flatness
   b. Orientation
   c. Straightness
   d. Profile

15. Datum shift is permitted when a datum is referenced at _____ and should be simulated at its _____.
   a. LMC; least material condition
   b. MMC; virtual condition
   c. RFS; actual mating size
   d. virtual condition; MMC

16. A flatness tolerance zone is formed by _____.
   a. two parallel lines
   b. two equidistant planar datums
   c. two parallel planes
   d. two parallel planes parallel with a common datum

17. A position tolerance zone can be formed by _____ related to one or more datums.
   a. two concentric cylinders
   b. a cylinder
   c. two parallel planes
   d. b. or c.

18. When a geometric tolerance is applied on an MMC basis, the worst case effects of the LMC feature size and geometric tolerance create what is known as a _____.
    a. virtual condition
    b. geometric boundary
    c. nominal limit
    d. resultant condition

19. A complete datum reference frame _____.
    a. controls three degrees of freedom
    b. is created by three features
    c. controls six degrees of freedom
    d. is created by datums A, B, and C

20. For an internal feature of size, virtual condition (MMC basis) is calculated using the following formula:
    a. MMC – LMC
    b. MMC – geometric tolerance
    c. MMC + bonus tolerance
    d. a. and b.

21. _____ is usually indicated when there is a need to preserve wall thickness.
    a. MMC
    b. LMC
    c. RFS
    d. Virtual condition

22. Basic angles must be shown on the print for _____ but are implied for _____.
    a. perpendicularity/angularity
    b. angularity/perpendicularity
    c. angularity/parallelism
    d. both b. and c.

23. When rule #1 applies, a form tolerance must always be _____ than the _____ tolerance.
    a. less/size
    b. equal or less/bonus
    c. greater/position
    d. greater/orientation

24. Position can also control _____.
    a. perpendicularity
    b. datum precedence
    c. circularity
    d. roundness

25. When parallelism of a surface is controlled, _____ is also controlled.
    a. straightness
    b. flatness
    c. form
    d. all of the above

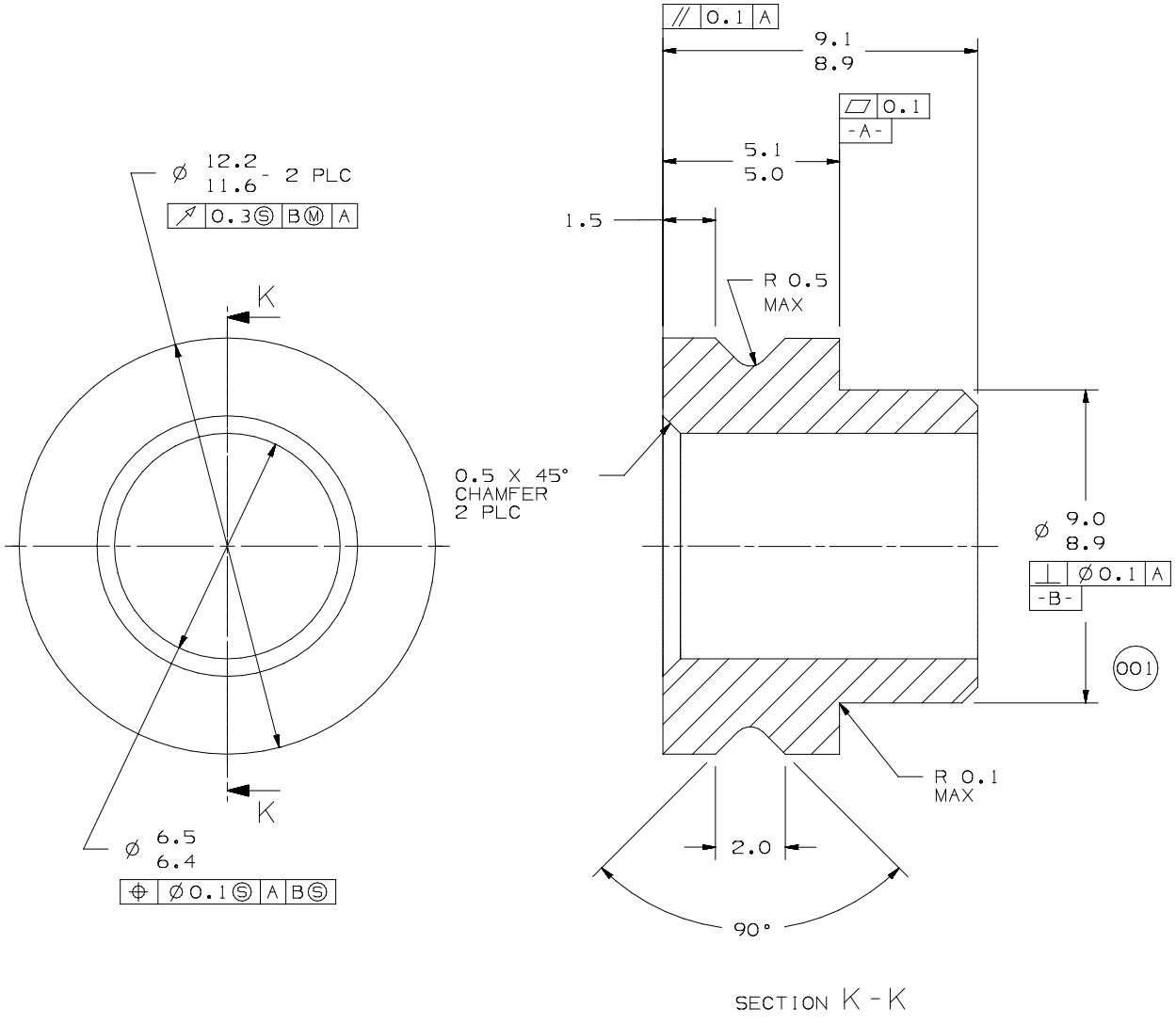
26. Runout can only be specified at _____, and must always be related to an axial _____.
    a. MMC/virtual condition
    b. MMC/tolerance
    c. RFS/datum
    d. both a. and b.

27. Straightness and circularity are examples of _____ controls, and are never related to a _____.
    a. orientation/size tolerance
    b. trigonometric/feature of size
    c. surface/centerplane
    d. form/datum

28. If a pin has a size specification of ∅ 15.0 ± 0.5 and a positional tolerance of ∅ 1.0 at MMC, what is the virtual condition?
    a. 14.5
    b. 15
    c. 15.5
    d. 16.5

29. If a hole has a size specification of ∅ 15.0 ± 0.5 and a positional tolerance of ∅ 0.5 at MMC, what is the maximum possible bonus tolerance available?
    a. 0.5
    b. 1
    c. 1.5
    d. 2

For questions 30-49, refer to the drawing below.



30. The runout tolerance _____.
    a. should not have modifiers
    b. should be changed to position
    c. should have a diameter symbol
    d. both a. and b.

31. The parallelism tolerance _____.
    a. is correct because it refers to a datum
    b. is unnecessary
    c. should be referenced to datum B at MMC
    d. should be changed to total runout

32. If datum B is pressed into the mating part, it should probably be simulated _____ using a _____ gage.
    a. LMC/variable
    b. MMC/fixed
    c. RFS/variable
    d. MMC/variable

33. The perpendicularity tolerance _____.
    a. should always be less than the size tolerance
    b. is unnecessary
    c. is valid
    d. should be changed to a position tolerance

34. The maximum bonus tolerance available on the position of the internal diameter is _____ mm.
    a. 0.2
    b. 0.1
    c. 0.05
    d. 0

35. The maximum possible distance between datum A and the left side of the part is _____ mm.
    a. 5.05
    b. 5.1
    c. 5.15
    d. 5

36. With respect to the position tolerance, the maximum datum shift on datum B is _____ mm.
    a. 0
    b. 0.025
    c. 0.05
    d. 0.1

37. Assuming a correct datum reference, if the runout tolerance were increased to 0.8 it would _____.
    a. control circularity also
    b. control only coaxiality
    c. be illegal
    d. both a. and b.

38. With datum B simulated RFS, the worst-case outer boundary on the 12.2 diameter would be _____ mm.
    a. 12.2
    b. 12.35
    c. 12.4
    d. 12.5

39. With datum B simulated RFS, the worst-case axial offset on the 12.2 diameter would be _____ mm.
    a. 0.05
    b. 0.15
    c. 0.3
    d. 0.4

40. If the RFS modifiers were changed to MMC on the position tolerance and on the datum B reference on the 6.5 diameter, the worst-case inner boundary on the 6.5 diameter would be _____ mm.
    a. 6.2
    b. 6.3
    c. 6.4
    d. 6.5

41. If the RFS modifiers were changed to MMC on the position tolerance and on the datum B reference on the 6.5 diameter, the worst-case offset between datum axis B and the axis of the 6.5 diameter would be _____ mm.
    a. 0.05
    b. 0.15
    c. 0.2
    d. 0.4

42. If the RFS modifiers were changed to MMC on the position tolerance and on the datum B reference on the 6.5 diameter, the worst-case resultant condition on the 6.5 diameter would be _____ mm.
    a. 6.7
    b. 6.8
    c. 6.9
    d. 7

43. If the RFS modifier were changed to LMC on the position tolerance on the 6.5 diameter, the worst-case resultant condition on the 6.5 diameter would be _____ mm.
    a. 6.2
    b. 6.3
    c. 6.35
    d. 6.4

44. If the RFS modifiers were changed to LMC only on the position tolerance on the 6.5 diameter, the minimum wall thickness between the 6.5 diameter and the datum B diameter would be _____ mm.
    a. 1.1
    b. 1.15
    c. 1.8
    d. 2.4

45. If the print were based on ASME Y14.5M-1994, _____.
    a. the use of the RFS symbol would be illegal
    b. the datum feature symbol would be different
    c. the interpretation of rule number 5 would be different
    d. both a. and b.

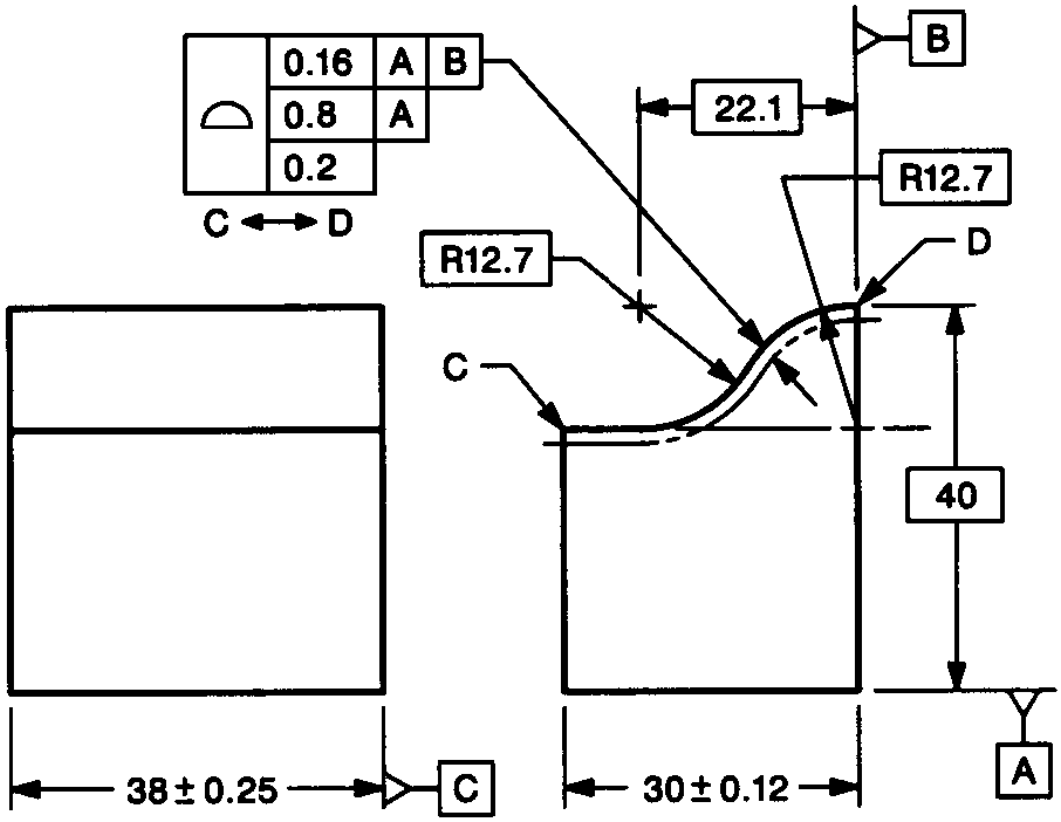
46. The flatness specification _____.
    a. is valid
    b. should be changed to 1.2
    c. should be changed to parallelism
    d. is unnecessary

47. Assuming datum B is simulated RFS, if the runout tolerance were correctly changed to a concentricity tolerance it would be _____.
    a. more restrictive
    b. less restrictive
    c. the same interpretation
    d. incorrect

48. If the RFS modifiers were changed to MMC on the position tolerance and datum B reference on the 6.5 diameter, the maximum bonus tolerance on the 6.5 diameter would be _____ mm.
    a. 0.05
    b. 0.1
    c. 0.15
    d. 0.2

49. If the RFS modifiers were changed to MMC on the position tolerance and on the datum B reference, the maximum wall thickness between datum feature B the 6.5 diameter would be _____ mm.
    a. 0.5
    b. 1.4
    c. 1.5
    d. 2

50-53 refer to the drawing below.



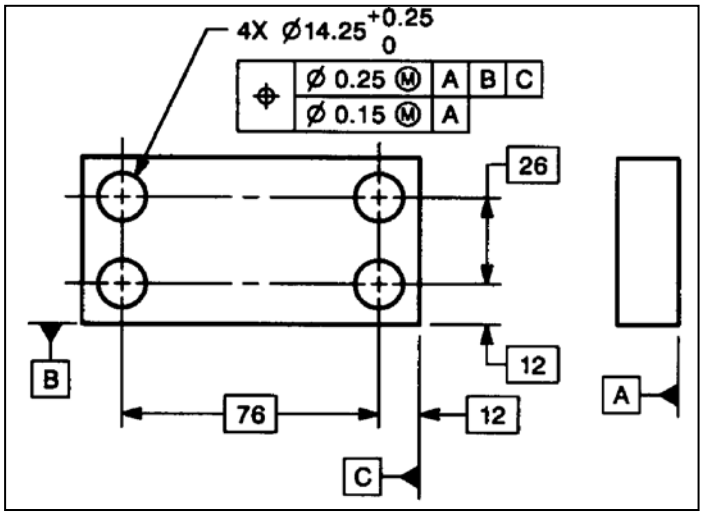
50. Datum C establishes a _____.
    a. planar datum
    b. center plane datum
    c. datum axis
    d. sixth degree of freedom

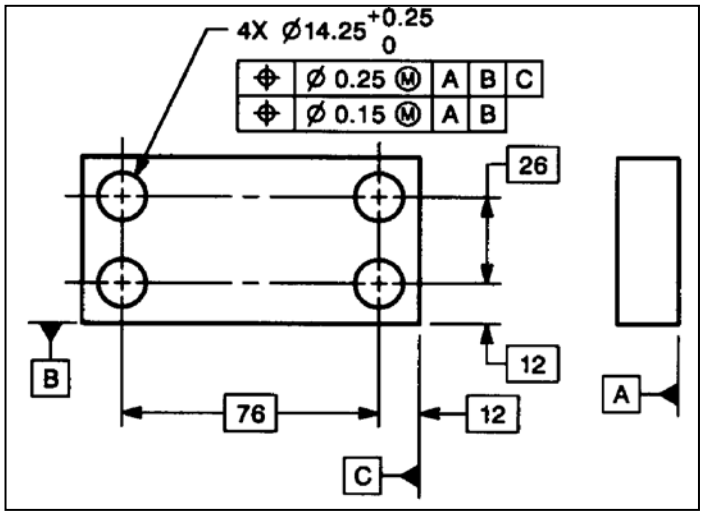
51. The maximum height of the part is _____ mm.
    a. 40.16
    b. 40.8
    c. 40.2
    d. 40

52. The maximum allowable form error on the top surface of the part is _____ mm.
    a. 0.16
    b. 0.8
    c. 0.2
    d. 0.1

53. The second segment of the feature control frame controls _____.
    a. form
    b. size
    c. orientation
    d. both a. and c.

54-60 refer to the drawings below.





54. The functional virtual condition calculated to ensure assembly with the mating part on both prints is _____ mm.
    a. 14
    b. 14.1
    c. 14.25
    d. 14.5

55. The minimum material thickness between the two rightmost holes on both prints is _____ mm.
    a. 11.1
    b. 11.6
    c. 11.7
    d. 11.9

56. The maximum cylindricity error on the four holes in both prints is _____ mm.
    a. 0.15
    b. 0.20
    c. 0.25
    d. 0.30

57. The feature relating tolerance zone framework in the left print controls _____.
    a. distance to datum B
    b. distance between the holes
    c. orientation to datums A and B
    d. all of the above

58. The feature relating tolerance zone framework in the right print controls _____.
    a. distance to datum B
    b. distance between the holes
    c. orientation to datums A and B
    d. all of the above

59. The pattern locating tolerance zone framework on the left print is _____ the right print.
    a. more restrictive than
    b. less restrictive than
    c. the same interpretation as
    d. more difficult to inspect than

60. The feature relating tolerance zone framework on the left print is _____ the right print.
    a. more restrictive than
    b. less restrictive than
    c. the same interpretation as
    d. more difficult to inspect than

Name _____ Date _____

Division _____ Dept. _____

Response Sheet

	a.	b.	c.	d.		a.	b.	c.	d.
1.	○	○	○	○	31.	○	○	○	○
2.	○	○	○	○	32.	○	○	○	○
3.	○	○	○	○	33.	○	○	○	○
4.	○	○	○	○	34.	○	○	○	○
5.	○	○	○	○	35.	○	○	○	○
6.	○	○	○	○	36.	○	○	○	○
7.	○	○	○	○	37.	○	○	○	○
8.	○	○	○	○	38.	○	○	○	○
9.	○	○	○	○	39.	○	○	○	○
10.	○	○	○	○	40.	○	○	○	○
11.	○	○	○	○	41.	○	○	○	○
12.	○	○	○	○	42.	○	○	○	○
13.	○	○	○	○	43.	○	○	○	○
14.	○	○	○	○	44.	○	○	○	○
15.	○	○	○	○	45.	○	○	○	○
16.	○	○	○	○	46.	○	○	○	○
17.	○	○	○	○	47.	○	○	○	○
18.	○	○	○	○	48.	○	○	○	○
19.	○	○	○	○	49.	○	○	○	○
20.	○	○	○	○	50.	○	○	○	○
21.	○	○	○	○	51.	○	○	○	○
22.	○	○	○	○	52.	○	○	○	○
23.	○	○	○	○	53.	○	○	○	○
24.	○	○	○	○	54.	○	○	○	○
25.	○	○	○	○	55.	○	○	○	○
26.	○	○	○	○	56.	○	○	○	○
27.	○	○	○	○	57.	○	○	○	○
28.	○	○	○	○	58.	○	○	○	○
29.	○	○	○	○	59.	○	○	○	○
30.	○	○	○	○	60.	○	○	○	○

Name _____ Date _____

Division _____ Dept. _____

Answer Key

	a.	b.	c.	d.
1.	○	◎	○	○
2.	○	○	○	◎
3.	○	◎	○	○
4.	○	○	○	◎
5.	◎	○	○	○
6.	○	○	◎	○
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8.	○	◎	○	○
9.	○	○	◎	○
10.	○	○	○	◎
11.	◎	○	○	○
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13.	◎	○	○	○
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26.	○	○	◎	○
27.	○	○	○	◎
28.	○	○	○	◎
29.	○	◎	○	○
30.	◎	○	○	○

	a.	b.	c.	d.
31.	○	◎	○	○
32.	○	○	◎	○
33.	○	○	◎	○
34.	○	○	○	◎
35.	○	◎	○	○
36.	◎	○	○	○
37.	○	◎	○	○
38.	○	○	○	◎
39.	○	◎	○	○
40.	○	◎	○	○
41.	○	○	◎	○
42.	◎	○	○	○
43.	◎	○	○	○
44.	○	◎	○	○
45.	○	◎	○	○
46.	○	○	○	◎
47.	○	◎	○	○
48.	○	◎	○	○
49.	○	◎	○	○
50.	○	◎	○	○
51.	○	○	○	◎
52.	○	○	◎	○
53.	○	○	○	◎
54.	○	◎	○	○
55.	◎	○	○	○
56.	○	○	◎	○
57.	○	◎	○	○
58.	○	○	○	◎
59.	○	○	◎	○
60.	○	◎	○	○