PRACTICE TEST 4: METAL STRUCTURAL REPAIR

Instructions: Select the best answer for each question. Each question is based on the Airframe Mechanic Certification Standards.

1. The 2024 aluminum alloy series uses what as the primary alloying element?
   A. Zinc
   B. Copper
   C. Magnesium
   D. Manganese

2. Clad aluminum sheet provides corrosion protection through:
   A. Paint coating only
   B. Anodized surface
   C. Pure aluminum surface layer over alloy core
   D. Chromate treatment

3. The -T6 temper designation indicates material has been:
   A. Annealed only
   B. Strain hardened
   C. As-fabricated
   D. Solution heat treated and artificially aged

4. The -O temper represents:
   A. Full hard condition
   B. Annealed, softest temper
   C. Half hard
   D. Solution heat treated

5. 2024-T3 Alclad is commonly used for:
   A. Pure aluminum applications
   B. Stainless steel replacement
   C. Aircraft structural sheet
   D. Engine components

6. The 7075 aluminum alloy series primary alloying element is:
   A. Copper
   B. Magnesium

C. Manganese
D. Zinc

7. Grain direction in aluminum sheet primarily affects:
   A. Color only
   B. Strength and formability
   C. Weight
   D. Corrosion resistance only

8. When bending aluminum, bends should be made:
   A. Across grain for maximum strength
   B. At random angles
   C. With grain parallel to bend line when practical
   D. Without considering grain

9. The neutral axis in a bend is where:
   A. Maximum tension occurs
   B. Maximum compression occurs
   C. Bend starts
   D. Material neither stretches nor compresses

10. Bend allowance is:
    A. Arc length along neutral axis needed for the bend
    B. Thickness of material
    C. Bend radius only
    D. Width of material

11. Minimum bend radius depends on:
    A. Color of material
    B. Material thickness, temper, grain direction
    C. Age of sheet
    D. Room temperature only

12. Setback in sheet metal bending is:
    A. Edge to edge distance
    B. Rivet to edge distance
    C. Distance from bend tangent line to mold point
    D. Hole spacing

13. The brake line is marked at:
    A. Inside mold line minus setback
    B. Outside mold line
    C. Neutral axis
    D. Random location

14. Stretching sheet metal:
    A. Compresses material
    B. Shrinks edges
    C. Requires heating only
    D. Thins and expands material by hammering

15. Shrinking sheet metal involves:
    A. Stretching outward
    B. Heating and compressing to gather excess
    C. Cutting away material
    D. Drilling holes

16. AN470 rivets feature what head style?
    A. Countersunk
    B. Brazier
    C. Universal head
    D. Flat head

17. AN426 rivets have:
    A. Round head
    B. Universal head
    C. Brazier head
    D. 100-degree countersunk head

18. The rivet material code "DD" designates:
    A. 2024-T4 aluminum alloy
    B. 2117-T4 alloy
    C. 5056 aluminum
    D. Mild steel

19. 2117-T4 rivets are identified by:
    A. Raised dot
    B. Plain unmarked head
    C. Two dashes
    D. Dimple

20. Ice box rivets require:
    A. Normal storage
    B. Painting for identification
    C. Refrigerated storage before installation
    D. Heating before use

21. Rivet diameter should be approximately:
    A. Three times sheet thickness

B. Equal to sheet thickness
C. Five times thickness
D. Two times thickness

22. Rivet length is determined by:
A. Hole diameter only
B. Sheet thickness only
C. Random selection
D. Grip plus 1.5 times diameter for shop head

23. Proper rivet spacing minimum is:
A. Equal to diameter
B. Two times diameter
C. Three times diameter
D. Random spacing

24. Minimum edge distance for rivets is:
A. Equal to diameter
B. Two times diameter
C. Five times diameter
D. Half diameter

25. Transverse pitch refers to:
A. Spacing along row
B. Rivet to edge
C. Across grain
D. Distance between rivet rows

26. Rivet hole drill size should be:
A. 0.003–0.005 inch larger than rivet diameter
B. Same as rivet
C. Much larger
D. Equal to rivet length

27. Countersinking depth should:
A. Go completely through
B. Be random
C. Allow rivet head flush with surface
D. Exceed rivet head depth

28. Dimpling is used to:
A. Mark holes
B. Form recess for flush rivets in thin sheet

C. Remove rivets
D. Straighten metal

29. A pneumatic rivet gun operates by:
    A. Rapid hammering action
    B. Gradual squeezing
    C. Rotational cutting
    D. Heating

30. The bucking bar during riveting:
    A. Drives the rivet
    B. Removes rivets
    C. Measures length
    D. Backs up shop head formation

31. Proper shop head dimensions are:
    A. Equal to shank diameter
    B. Three times diameter
    C. 1.5 times diameter width, 0.5 times height
    D. Any size

32. Rivet squeezing uses:
    A. Hammer only
    B. Matched dies applying pressure
    C. Heat only
    D. Hand pressure

33. Properly driven rivets show:
    A. Gaps between sheets
    B. Cracked head
    C. Loose fit
    D. Fully formed shop head, tight, no cracks

34. Insufficient rivet upset results in:
    A. Shop head too small or thin
    B. Perfect head
    C. Excessive head
    D. Cracked manufactured head

35. Excessive rivet upset causes:
    A. Perfect rivet
    B. Shop head too large, possible cracking
    C. No shop head
    D. Loose rivet

36. Rivet "icing" indicates:
    A. Perfect installation
    B. Cold rivet
    C. Cracks radiating from manufactured head
    D. Proper upset

37. Preferred solid rivet removal method is:
    A. Drilling slightly smaller than shank, punching out
    B. Melting
    C. Sawing
    D. Pulling with pliers

38. Cherry rivets are:
    A. Solid rivets
    B. Welded fasteners
    C. Machine screws
    D. Blind rivets for one-side installation

39. Pop rivets feature:
    A. Threaded shank
    B. Mandrel pulling through and breaking off
    C. Solid construction
    D. Welded tail

40. Blind rivet strength is typically:
    A. Equal to solid rivets
    B. Greater than solid rivets
    C. 60–75% of equivalent solid rivets
    D. 25% of solid rivets

41. Blind rivets are used when:
    A. Both sides accessible
    B. Maximum strength needed
    C. Never appropriate
    D. Access limited to one side only

42. Huck fasteners:
    A. Use collar swaged onto grooved pin
    B. Are temporary
    C. Require heating
    D. Are adhesive-bonded

43. Cherrymax rivets differ by having:
    A. Lower strength

B. Different color
C. Mechanical locking feature for higher strength
D. Larger diameter only

44. Hi-Lok fasteners:
A. Require heating
B. Combine threaded pin with torque-off collar
C. Are adhesive
D. Are temporary

45. Lockbolts combine:
A. Rivet and bolt characteristics with swaged collar
B. Adhesive joints
C. Welds
D. Machine screws

46. Jo-bolts are:
A. Solid rivets
B. Adhesive fasteners
C. Spot welds
D. Blind bolts for one-sided installation

47. Structural repairs must restore:
A. 75% strength
B. 100% minimum original strength
C. 90% strength
D. Any strength

48. Flush patches are used when:
A. Additional strength needed
B. Internal access impossible
C. Aerodynamic smoothness required
D. Either B or C

49. Scab patches are applied:
A. On one or both sides overlapping damage
B. Without fasteners
C. By welding only
D. Flush to skin

50. Patch material should be:
A. Different alloy
B. Heavier always

C. Lighter gauge
D. Same alloy and temper or approved substitute

51. Minimum patch overlap beyond damage is:
    A. 0.5 inch
    B. One rivet spacing minimum
    C. 0.25 inch
    D. Three inches

52. Repair rivet spacing should:
    A. Be random
    B. Exceed original
    C. Match original structure spacing
    D. Be tighter always

53. Butt splice repairs require:
    A. No backing
    B. Single patch
    C. Welding only
    D. Backing plates on both sides

54. A joggle creates:
    A. Offset for flush lap joint
    B. Reinforcement
    C. Bend radius
    D. Hole pattern

55. Stop-drilling a crack:
    A. Makes crack longer
    B. Removes material
    C. Drills hole at crack tip preventing propagation
    D. Welds crack

56. Cracks in highly stressed areas require:
    A. Stop-drilling only
    B. Engineering evaluation and approved repair
    C. Ignoring
    D. Paint only

57. Reinforcement doublers:
    A. Add thickness and strength to structure
    B. Weaken structure
    C. Are decorative
    D. Increase corrosion

58. Skin damage assessment considers:
    A. Color only
    B. Age only
    C. Paint condition only
    D. Size, location, and stress level

59. Negligible damage limits allow:
    A. Any size damage
    B. Large damage anywhere
    C. Small damage in low-stress areas within limits
    D. Never allowed

60. Extensive damage requires:
    A. Stop-drilling only
    B. Component replacement or major repair with approval
    C. Paint repair
    D. Ignoring

61. Sheet metal layout requires:
    A. Random measurements
    B. Guessing
    C. No measurements
    D. Precise measurements and proper development

62. Transfer punch is used to:
    A. Mark hole locations accurately from existing holes
    B. Remove rivets
    C. Bend metal
    D. Cut metal

63. Clecos are:
    A. Permanent rivets
    B. Temporary fasteners holding parts during assembly
    C. Measuring tools
    D. Hole cutters

64. Sheet metal shears cut by:
    A. Drilling
    B. Sawing
    C. Scissor-action blades
    D. Melting

65. Files for aluminum should have:
    A. Single-cut teeth preventing loading

B. Dull edges
C. Rust
D. No teeth

66. Deburring removes:
A. Paint
B. Rivets
C. Bends
D. Sharp edges and burrs from operations

67. Corrosion treatment involves:
A. Painting over corrosion
B. Ignoring
C. Removing corrosion and conversion coating
D. Adding oil

68. Alodine treatment:
A. Removes material
B. Chromate conversion coating providing corrosion resistance
C. Paint system
D. Welding flux

69. Magnesium alloys are identified by:
A. Aluminum codes
B. Steel codes
C. Copper codes
D. Letter codes like AZ, ZK

70. Magnesium requires care because:
A. It's highly corrosion-prone and fire risk when machining
B. It's very heavy
C. Never corrodes
D. Cannot be formed

71. Titanium is used for:
A. Low cost
B. High strength-to-weight ratio and heat resistance
C. Easy forming
D. Low strength

72. Steel sheet repairs may require:
A. Aluminum rivets
B. Plastic fasteners

C. Cadmium-plated steel rivets or special fasteners
D. Wood screws

73. Dissimilar metal corrosion is prevented by:
A. Ignoring problem
B. Direct contact
C. Water exposure
D. Insulation with primer and sealant

74. Riveted repair inspection checks:
A. Proper installation, no gaps, correct pattern
B. Paint color only
C. Weight only
D. Age only

75. Rivet pattern inspection verifies:
A. Random spacing
B. No pattern
C. Proper spacing, edge distance, alignment
D. Any arrangement

76. Gaps between patch and structure indicate:
A. Perfect fit
B. Improper fit requiring correction
C. Acceptable condition
D. Enhanced strength

77. Straightening bent aluminum:
A. Cannot be done
B. Requires melting
C. Weakens always
D. Uses controlled force, checking for cracks

78. Bumping and dollying:
A. Shape metal for compound curves using hammer and dolly
B. Damage metal
C. Remove paint only
D. Drill holes

79. Lightening holes:
A. Weaken randomly
B. Reduce weight while maintaining strength with reinforcement
C. Should be added anywhere
D. Are prohibited

80. Flanging edges:
    A. Weakens material
    B. Removes material
    C. Bends edge perpendicular for stiffening
    D. Paints edges

81. Beading sheet metal:
    A. Forms raised or depressed stiffening ribs
    B. Adds decorative paint
    C. Removes material
    D. Welds seams

82. Piano hinge is installed:
    A. In short sections
    B. Without pin
    C. Welded
    D. Full length with pin through

83. Flush head screws are used when:
    A. Protruding heads acceptable
    B. No access needed
    C. Aerodynamic smoothness required
    D. Temporary installation

84. Self-tapping screws:
    A. Require pre-tapped holes always
    B. Form or cut own threads
    C. Cannot be removed
    D. Are welded

85. Safety wire prevents:
    A. Corrosion
    B. Paint chipping
    C. Weight increase
    D. Fastener loosening from vibration

86. Safety wire direction should:
    A. Tighten fastener
    B. Loosen fastener
    C. Have no effect
    D. Be either direction

87. Cotter pins secure:
    A. Sheet metal

B. Paint
C. Castle nuts and clevis pins
D. Fabric

88. Crack inspection uses:
A. Paint only
B. Dye penetrant, eddy current, or visual methods
C. Ignoring cracks
D. Heat

89. Dye penetrant detects:
A. Surface-breaking cracks by capillary action
B. Internal defects only
C. Color only
D. Weight

90. Eddy current inspection:
A. Requires contact only
B. Only works on wood
C. Measures weight
D. Detects defects in conductive materials

91. Fastener hole elongation indicates:
A. Perfect condition
B. No problem
C. Excessive wear requiring repair
D. Enhanced strength

92. Corrosion under paint appears as:
A. Smooth surface
B. Blistering or lifting paint
C. Enhanced adhesion
D. No indication

93. Intergranular corrosion:
A. Is surface only
B. Is harmless
C. Strengthens metal
D. Attacks grain boundaries with little surface indication

94. Stress corrosion cracking requires:
A. Tensile stress and corrosive environment
B. Compression only

C. No stress
D. Paint only

95. Heat-affected zone in welds:
A. Is unaffected
B. Area adjacent to weld with altered properties
C. Is stronger always
D. Does not exist

96. Mixing aluminum alloys in repairs:
A. Is required
B. Improves strength always
C. Should be avoided; use same alloy
D. Has no effect

97. Structural repair documentation includes:
A. Description, materials, methods, approvals, sketches
B. Nothing
C. Cost only
D. Date only

98. Major repairs require approval from:
A. Owner only
B. Anyone
C. No approval
D. IA, repair station, or manufacturer with Form 337

99. Field approval involves:
A. No FAA involvement
B. Submitting repair design to FAA for approval
C. Owner approval
D. Verbal agreement

100. Repair limits are exceeded when:
A. Damage is very small
B. Matches original
C. Damage exceeds size, location, or stress limits in manual
D. Any size

Answer Explanations

1. B. Copper The 2024 aluminum alloy series uses copper as the primary alloying element (2xxx series = copper). Provides excellent strength-to-weight ratio for aircraft structural applications.

2. C. Pure aluminum surface layer over alloy core Clad aluminum has thin pure aluminum surface layers (typically 5.5% thickness each side) metallurgically bonded over stronger alloy core, providing sacrificial corrosion protection.

3. D. Solution heat treated and artificially aged T6 temper indicates material solution heat treated to dissolve alloying elements, quenched, then artificially aged at elevated temperature for maximum strength through precipitation hardening.

4. B. Annealed, softest temper O temper (letter O) represents fully annealed condition with lowest strength and hardness but maximum formability, used when extensive forming required before heat treatment.

5. C. Aircraft structural sheet 2024-T3 Alclad is standard sheet material for aircraft structures, combining high strength of 2024 alloy with corrosion protection from pure aluminum cladding layer.

6. D. Zinc 7075 aluminum alloy series uses zinc as primary alloying element (7xxx = zinc series), providing highest strength among common aircraft aluminum alloys.

7. B. Strength and formability Grain direction significantly affects material strength (stronger parallel to grain) and formability (bending across grain causes cracking more readily than bending parallel).

8. C. With grain parallel to bend line when practical Bends made with grain parallel to bend line minimize cracking risk by avoiding stretching and breaking grain structure across grain direction.

9. D. Material neither stretches nor compresses Neutral axis is theoretical line through bend where material maintains original length, experiencing neither tension (outer surface) nor compression (inner surface).

10. A. Arc length along neutral axis needed for the bend Bend allowance is arc length along neutral axis consumed by bend, calculated and added to flat pattern layout for accurate finished dimensions.

11. B. Material thickness, temper, grain direction Minimum bend radius depends on thickness (thicker requires larger radius), temper (softer allows tighter bends), and grain direction (tighter radius parallel to grain).

12. C. Distance from bend tangent line to mold point Setback is distance from bend tangent line (where bend starts) to mold point (intersection of extended leg lines), essential for calculating brake positioning.

13. A. Inside mold line minus setback Brake line (sight line) is marked at inside mold line minus setback, positioning material correctly in brake for desired finished dimensions.

14. D. Thins and expands material by hammering Stretching increases surface area by hammering material causing it to thin and expand, used to create compound curves and eliminate excess material buckles.

15. B. Heating and compressing to gather excess Shrinking reduces surface area by heating localized areas then hammering while hot to gather and compress material, creating compound curves through controlled distribution.

16. C. Universal head AN470 rivets feature universal head (rounded head similar to MS20470), most common rivet type for general structural applications providing good bearing and shear resistance.

17. D. 100-degree countersunk head AN426 rivets have 100-degree countersunk head for flush installation in countersunk holes, providing aerodynamic smoothness where protruding heads unacceptable.

18. A. 2024-T4 aluminum alloy The AN rivet material code "DD" designates 2024-T4 aluminum alloy rivets used for high-strength applications, requiring refrigerated storage before installation preventing premature aging.

19. B. Plain unmarked head 2117-T4 rivets have plain heads with no identifying marks, field-driven at room temperature without refrigeration, adequate strength for most applications.

20. C. Refrigerated storage before installation Ice box rivets (2024-T4 and 2017-T4) must be refrigerated at 0°F or below preventing premature aging after solution heat treatment, maintaining drivability.

21. A. Three times sheet thickness Rivet diameter should be approximately three times the thickness of thickest sheet being joined, providing adequate bearing area preventing sheet tearing while allowing proper upset.

22. D. Grip plus 1.5 times diameter for shop head Rivet length equals grip (total material thickness) plus 1.5 times rivet diameter for shop head formation, ensuring adequate upset without excessive protrusion.

23. C. Three times diameter Rivet spacing (pitch) minimum three times rivet diameter prevents rivet-to-rivet interference and sheet buckling between rivets. Typical spacing 4-6 times diameter for structures.

24. B. Two times diameter Edge distance (center of rivet to edge) minimum two times rivet diameter prevents edge tearing during installation and under load, closer spacing risks failure.

25. D. Distance between rivet rows Transverse pitch is perpendicular distance between parallel rivet rows, distinguished from pitch (spacing along row) which is longitudinal distance between rivets.

26. A. 0.003-0.005 inch larger than rivet diameter Rivet holes drilled 0.003-0.005 inch oversize allows easy rivet insertion while providing sufficient material for hole to fill during upset, creating tight fit.

27. C. Allow rivet head flush with surface Countersinking depth should allow manufactured rivet head to sit flush or slightly below surface after installation, providing aerodynamic smoothness without excessive material removal.

28. B. Form recess for flush rivets in thin sheet Dimpling forms depression in thin sheet (typically under 0.040 inch) for flush rivets without removing material, stronger than countersinking which weakens sheet.

29. A. Rapid hammering action Pneumatic rivet gun uses compressed air powering piston that rapidly hammers rivet set driving rivet and forming shop head, typically 2000-4000 blows per minute.

30. D. Backs up shop head formation Bucking bar is heavy steel bar held against rivet shank end providing resistance while manufactured head is struck, forming shop head through mass absorption.

31. C. 1.5 times diameter width, 0.5 times height Proper shop head dimensions are 1.5 times shank diameter width and 0.5 times diameter height, providing adequate bearing area without excessive material consumption.

32. B. Matched dies applying pressure Rivet squeezing uses C-frame or alligator squeezer with matched dies applying steady pressure forming both heads simultaneously, quieter and more consistent than hammering.

33. D. Fully formed shop head, tight, no cracks Properly driven rivet shows fully formed shop head with correct dimensions, fills hole completely, sits tight without gaps, and has no cracks or bucktails.

34. A. Shop head too small or thin Insufficient upset produces shop head smaller or thinner than specifications from rivet too short, excessive grip, or inadequate driving force, compromising strength.

35. B. Shop head too large, possible cracking Excessive upset creates shop head larger than specifications potentially causing cracks from overworking material, resulting from rivet too long or excessive driving.

36. C. Cracks radiating from manufactured head Rivet "icing" describes cracks radiating from manufactured head center resembling cracked ice, caused by excessive driving force or improper rivet gun technique.

37. A. Drilling slightly smaller than shank, punching out Preferred rivet removal drills manufactured head with bit approximately 1/64 inch smaller than shank diameter, then punches remaining shank through minimizing hole damage.

38. D. Blind rivets for one-side installation Cherry rivets are blind rivets installed from one side when back side inaccessible, stem pulls through body forming blind head then breaks at predetermined tension.

39. B. Mandrel pulling through and breaking off Pop rivets (pull-through blind rivets) have mandrel pulled through hollow body by installation tool, forming blind head then breaking at manufactured break point.

40. C. 60-75% of equivalent solid rivets Blind rivet strength typically 60-75% of equivalent solid rivets due to hollow construction and reduced upset, used where solid rivets impossible but adequate strength available.

41. D. Access limited to one side only Blind rivets used when access limited to one side making solid rivet installation impossible, common in closed sections, fuel tanks, or areas bucking bar cannot reach.

42. A. Use collar swaged onto grooved pin Huck fasteners use pin with collar swaged onto grooved pin using special tool, providing very high strength vibration-resistant connection similar to bolts.

43. C. Mechanical locking feature for higher strength Cherrymax rivets feature mechanical locking mechanism preventing stem pullout, providing higher strength and more consistent installation than standard Cherry blind rivets.

44. B. Combine threaded pin with torque-off collar Hi-Lok fasteners use threaded pin with collar featuring break-off torque feature, collar breaks at predetermined torque ensuring precise consistent installation.

45. A. Rivet and bolt characteristics with swaged collar Lockbolts combine bolt features (removable pin) and rivet features (permanent swaged collar), providing high-strength structural connection installed with special power tools.

46. D. Blind bolts for one-sided installation Jo-bolts are blind bolts providing high-strength threaded fastener from one side, sleeve expands behind structure creating threads allowing bolt installation with limited access.

47. B. 100% minimum original strength Structural repairs must restore minimum 100% of original strength, understrength repairs compromise airworthiness, repairs may exceed original but cannot be less than full.

48. C. Aerodynamic smoothness required Flush patches used when aerodynamic smoothness required (external skin surfaces) and/or when internal access impossible preventing installation of internal backing plates.

49. A. On one or both sides overlapping damage Scab (lap) patches install on external surface overlapping damage area, fastened with rivets through original structure, simple repair when flush surface not required.

50. D. Same alloy and temper or approved substitute Patch material must match original alloy and temper ensuring compatible strength, corrosion resistance, and thermal expansion, approved substitute materials documented in repair data.

51. B. One rivet spacing minimum Patch must extend minimum one rivet spacing beyond damage edge ensuring adequate load transfer and preventing stress concentration at damage boundary.

52. C. Match original structure spacing Repair rivet spacing should duplicate original structure pattern maintaining intended load distribution and preventing localized stress concentrations from altered spacing patterns.

53. D. Backing plates on both sides Butt splice repairs require backing plates on both sides of joint providing bearing surface for fasteners and transferring loads across joint discontinuity maintaining structural continuity.

54. A. Offset for flush lap joint Joggle is formed offset in sheet creating step allowing flush lap joint where two sheets meet, one sheet jogs over to lap other maintaining smooth external surface.

55. C. Drills hole at crack tip preventing propagation Stop-drilling drills smooth round hole at crack tip eliminating sharp stress concentration point that drives crack propagation, temporary measure requiring permanent repair evaluation.

56. B. Engineering evaluation and approved repair Cracks in highly stressed primary structure require engineering analysis determining cause, evaluating remaining strength, and designing approved repair, stop-drilling alone inadequate for critical areas.

57. A. Add thickness and strength to structure Reinforcement doublers add material thickness increasing section strength without replacing original structure, used to strengthen areas experiencing higher-than-design loads.

58. D. Size, location, and stress level Skin damage assessment evaluates damage size relative to repair limits, location (high-stress vs. low-stress area), and proximity to load-bearing structure determining repair requirements.

59. C. Small damage in low-stress areas within limits Negligible damage limits defined in maintenance manual allow small scratches, dents, or nicks in low-stress areas without repair when within specified depth and size limits.

60. B. Component replacement or major repair with approval Extensive damage exceeding repair manual limits requires component replacement or major repair with engineering approval including stress analysis, repair design, and FAA approval.

61. D. Precise measurements and proper development Sheet metal layout requires accurate measurements, proper bend allowance calculations, and correct development of flat pattern ensuring finished part matches design dimensions.

62. A. Mark hole locations accurately from existing holes Transfer punch has spring-loaded center punch fitting into existing holes, striking punch marks precise hole location on underlying part ensuring accurate hole alignment.

63. B. Temporary fasteners holding parts during assembly Clecos are spring-loaded temporary fasteners inserting into drilled holes holding parts in precise alignment during assembly operations, removed as permanent fasteners installed.

64. C. Scissor-action blades Sheet metal shears cut using scissor-action between stationary and moving blades, blade clearance critical, too much clearance tears metal, too little dulls blades.

65. A. Single-cut teeth preventing loading Files for aluminum should have single-cut teeth preventing aluminum from loading (clogging) between teeth, soft aluminum fills double-cut file teeth rapidly reducing effectiveness.

66. D. Sharp edges and burrs from operations Deburring removes sharp edges and raised burrs left from cutting, drilling, and punching operations, essential for safety preventing cuts and ensuring proper fit.

67. C. Removing corrosion and conversion coating Corrosion treatment involves mechanically removing all corrosion products down to bright metal, treating with chemical conversion coating (Alodine), then protecting with primer and paint.

68. B. Chromate conversion coating providing corrosion resistance Alodine (chromate conversion coating) chemically treats aluminum creating thin chromate layer providing corrosion resistance and excellent paint adhesion, characteristic golden color on aluminum.

69. D. Letter codes like AZ, ZK Magnesium alloys identified by letter designations indicating alloying elements (A=aluminum, Z=zinc, K=zirconium) followed by percentages, example: AZ31B contains 3% aluminum, 1% zinc.

70. A. It's highly corrosion-prone and fire risk when machining Magnesium requires special handling due to severe corrosion susceptibility requiring protective treatments and fire hazard when machining, fine chips ignite easily burning intensely.

71. B. High strength-to-weight ratio and heat resistance Titanium used in aircraft for exceptional strength-to-weight ratio (stronger than aluminum, lighter than steel) and heat resistance maintaining strength at elevated temperatures near engines.

72. C. Cadmium-plated steel rivets or special fasteners Steel sheet metal repairs require compatible cadmium-plated steel rivets, stainless steel rivets, or special fasteners, aluminum rivets inadequate strength, dissimilar metals cause corrosion.

73. D. Insulation with primer and sealant Dissimilar metal corrosion prevented by insulating materials with primer coatings and sealants preventing electrical contact, electrolyte (moisture) presence creates galvanic cell causing corrosion.

74. A. Proper installation, no gaps, correct pattern Inspection verifies proper rivet shop head formation, no gaps between sheets indicating incomplete installation, correct rivet pattern matching design, and no tilted or cracked rivets.

75. C. Proper spacing, edge distance, alignment Rivet pattern inspection confirms spacing meets minimum requirements, edge distances adequate preventing tearing, rows properly aligned, and pattern matches design specifications.

76. B. Improper fit requiring correction Gaps between patch and structure indicate improper fit from incorrect forming or alignment, must be corrected before fastening ensuring load transfer and preventing stress concentrations.

77. D. Uses controlled force, checking for cracks Straightening bent aluminum uses controlled force from hammers, forming blocks, or presses, after straightening carefully inspect for cracks because working strain-hardens material reducing ductility.

78. A. Shape metal for compound curves using hammer and dolly Bumping and dollying techniques shape sheet metal into compound curves using hammer on one side and dolly (formed steel block) backing from opposite side.

79. B. Reduce weight while maintaining strength with reinforcement Lightening holes reduce structural weight while maintaining strength when properly designed with reinforced edges (flanged or with reinforcing rings) and located in low-stress areas.

80. C. Bends edge perpendicular for stiffening Flanging bends sheet edge perpendicular to surface creating stiffening lip increasing rigidity and providing edge for attachment to other components.

81. A. Forms raised or depressed stiffening ribs Beading forms shallow raised or depressed ribs in sheet metal increasing stiffness without adding significant weight, common in aircraft skin panels preventing oil-canning.

82. D. Full length with pin through Piano hinge (continuous hinge) installs full length of joint with pin running through interleaved knuckles, provides continuous support distributing loads uniformly along entire length.

83. C. Aerodynamic smoothness required Flush head screws (flathead) install in countersunk holes sitting flush with surface providing aerodynamic smoothness, used on external surfaces where protruding heads increase drag.

84. B. Form or cut own threads Self-tapping screws form (thread-forming) or cut (thread-cutting) own threads during installation, thread-forming screws displace material, thread-cutting screws remove material creating threads.

85. D. Fastener loosening from vibration Safety wire prevents fastener loosening from vibration by creating positive mechanical lock, wire tension opposes loosening direction maintaining fastener torque under vibratory loads.

86. A. Tighten fastener Safety wire installed so tension on wire tightens fastener in normal rotation direction, wire routed through fastener so pulling wire increases rather than decreases torque.

87. C. Castle nuts and clevis pins Cotter pins insert through holes in castle nut slots and drilled fastener shank then spread preventing nut rotation, primary use securing castle nuts and clevis pins.

88. B. Dye penetrant, eddy current, or visual methods Crack inspection uses various NDT methods: dye penetrant for surface cracks, eddy current for surface and near-surface cracks in conductive materials, visual inspection with magnification.

89. A. Surface-breaking cracks by capillary action Dye penetrant inspection applies liquid penetrant entering surface-breaking cracks through capillary action, developer draws penetrant from cracks creating visible indications revealing crack location.

90. D. Detects defects in conductive materials Eddy current inspection induces electromagnetic fields in conductive materials detecting cracks, corrosion, and material changes at or near surface, effective on aluminum without extensive preparation.

91. C. Excessive wear requiring repair Fastener hole elongation indicates excessive wear from relative motion or overload conditions, requires installation of oversize fasteners or bushing repair restoring original tolerances.

92. B. Blistering or lifting paint Corrosion under paint appears as paint blistering or lifting from corrosion products expanding beneath coating, indicates coating failure allowing moisture penetration and corrosion development.

93. D. Attacks grain boundaries with little surface indication Intergranular corrosion attacks aluminum grain boundaries deep into material with minimal surface indication, severely reduces strength, detection requires careful examination sometimes material removal.

94. A. Tensile stress and corrosive environment Stress corrosion cracking requires simultaneous presence of tensile stress (applied or residual) and specific corrosive environment, cracks propagate perpendicular to tensile stress potentially causing failure.

95. B. Area adjacent to weld with altered properties Heat-affected zone (HAZ) is material area adjacent to weld exposed to high temperature altering metallurgical properties without melting, properties differ from base metal and weld.

96. C. Should be avoided; use same alloy Mixing aluminum alloys in repairs avoided because different alloys have incompatible strength, corrosion resistance, and thermal expansion characteristics, use same alloy as original structure.

97. A. Description, materials, methods, approvals, sketches Structural repair documentation includes damage description, materials used with specifications, repair methods and procedures, approvals and inspector information, and sketches or photos showing repair.

98. D. IA, repair station, or manufacturer with Form 337 Major structural repairs require approval for return to service from Inspection Authorization mechanic, certificated repair station, or manufacturer, documented on FAA Form 337.

99. B. Submitting repair design to FAA for approval Field approval process involves submitting detailed repair design with engineering analysis and supporting data to local FAA office for review and approval when approved repair data unavailable.

100. C. Damage exceeds size, location, or stress limits in manual Repair limits exceeded when damage size, location in critical area, or affected stress level exceeds limits specified in aircraft maintenance manual requiring major repair or component replacement.