PRACTICE EXAM 9 SIMULATION

1. A mechanic must explain why a reciprocating engine fires its spark before top dead center while a turbine needs ignition only at start. The most accurate combined explanation is:

A. Both engines require continuous spark throughout operation

B. The piston engine's spark fires after TDC, and the turbine fires continuously

C. The piston engine's mixture needs time to burn so the spark leads TDC, while turbine combustion is continuous and self-sustaining after light-off

2. An excessively lean mixture at high power can cause detonation and high cylinder head temperatures because a lean mixture:

A. Burns hotter, raising CHT and promoting end-gas detonation

B. Floods the cylinder with excess fuel

C. Lowers the compression ratio of the engine

3. A mechanic links a falling oil pressure with a rising oil temperature and metal on the chip detector. The single condition that best ties these together is:

A. A clogged induction air filter

B. An overfilled oil sump

C. A failing bearing breaking down internally

4. A turbocharged engine that is overboosting both reduces engine life and risks detonation. The component whose failure most directly explains both effects is the:

A. Wastegate failing to relieve exhaust to the turbine

B. Oil pressure relief valve

C. Propeller governor

5. A mechanic explains why a constant-speed-prop engine shows a manifold-pressure drop (not an RPM drop) during induction icing. The reason combines:

A. The governor holding RPM by changing blade pitch while ice restricts airflow

B. The magneto retiming itself automatically

C. The mixture leaning as ice melts

6. A high-bypass turbofan is both more efficient and quieter than a turbojet. The single design feature that produces both benefits is the:

A. Higher turbine inlet temperature

B. Shorter exhaust nozzle

C. Large bypass stream moving more air at lower velocity

7. A mechanic must explain why oil is described as a cooling agent and why oil temperature and pressure are read together. The best integrated answer is:

A. Oil only lubricates and its instruments are unrelated

B. Oil carries heat from internal parts, so its temperature and pressure together reveal internal condition

C. Oil pressure measures engine RPM directly

8. A reciprocating engine's exhaust system serves both to route gases overboard and to supply cabin heat, which is why a crack is doubly serious because it can:

A. Only reduce engine power

B. Both lower performance and introduce carbon monoxide into the cabin

C. Only increase fuel consumption

9. A mechanic must connect the magneto's E-gap, internal timing, and external timing. The correct relationship is:

A. External timing sets points to the E-gap; internal timing sets the crankshaft position

B. E-gap is irrelevant once external timing is set

C. Internal timing aligns points-opening to the E-gap; external timing sets the spark to the crankshaft position

10. A life-limited turbine disk and a TBO-limited piston engine are governed by different rules. The accurate distinction is:

A. The disk must be retired at its limit regardless of condition; the piston engine may run past TBO based on condition

B. Both must be retired at their limits regardless of condition

C. Both may continue indefinitely based on condition

11. A mechanic ties together why fuel injection eliminates carburetor icing but complicates hot starting. The combined reason is:

A. Fuel is injected at the cylinder (no venturi cooling) but can vaporize in hot lines

B. Fuel injection adds a venturi that ices more easily

C. Fuel injection has no effect on icing or starting

12. A turbine engine's thrust falls with both altitude and increasing airspeed. The unifying principle behind both is that thrust depends on:

A. The fuel control's automatic settings only

B. Mass airflow and the change in gas velocity, both reduced by thin air or high inlet speed

C. The exhaust nozzle area alone

13. A mechanic explains why a rich mixture is used for takeoff but a leaner mixture for cruise. The integrated reasoning is:

A. Rich is leaner than lean at altitude

B. Rich provides best power and cooling for high load; lean provides best economy at lower power

C. Both mixtures provide identical performance

14. A dry-sump system's scavenge pump has greater capacity than its pressure pump, which connects to the fact that scavenged oil is:

A. Hot and aerated, occupying more volume than the supplied oil

B. Cooler and denser than the supplied oil

C. Identical in volume to the supplied oil

15. A mechanic must explain why detonation and pre-ignition both overheat an engine yet differ in timing. The accurate combined statement is:

A. Both ignite the mixture before the spark

B. Both ignite the mixture only after the exhaust valve opens

C. Detonation is uncontrolled burning after the spark; pre-ignition is ignition before the spark by a hot spot

16. A turbine engine's bleed air is used for anti-ice and pressurization, and extracting it slightly reduces thrust because the bleed air is:

A. Drawn from the exhaust, adding back pressure

B. Compressor air that would otherwise contribute to thrust

C. Cold ram air with no energy cost

17. A mechanic connects cylinder cooling fins, baffles, and oil to the overall thermal management of a piston engine. The integrated view is:

A. Only the fins remove heat; oil plays no role

B. Only the oil cools the engine; fins are decorative

C. Fins shed heat to cooling air directed by baffles, while oil carries heat from internal parts

18. A turbine engine's highest pressure and highest temperature occur at different locations, which a mechanic must keep distinct:

A. Both peak at the exhaust nozzle

B. Highest pressure at the diffuser; highest temperature at the turbine inlet

C. Highest pressure at the turbine inlet; highest temperature at the diffuser

19. A mechanic explains why a propeller blade is twisted and why centrifugal force matters. The combined statement is:

A. The blade is untwisted and centrifugal force is negligible

B. The twist increases tip drag and centrifugal force is unimportant

C. The blade is twisted because the tip moves faster, and centrifugal force is the largest force on the rotating blade

20. A mechanic ties the differential compression test result to its diagnosis. A reading of 60/80 with air at the exhaust pipe means:

A. The rings are worn, since air reaches the breather

B. The intake valve leaks, since air reaches the carburetor

C. The exhaust valve is leaking, since air escapes at the exhaust pipe

21. A mechanic must explain why turbine ignition exciters are dangerous to service even after power is removed. The reason is that the exciter:

A. Stores high electrical energy that must be allowed to bleed down

B. Contains pressurized fuel

C. Remains mechanically spinning for minutes

22. A mechanic connects the function of the oil pressure relief valve and the thermostatic valve. The accurate distinction is:

A. Both control oil temperature

B. The relief valve controls pressure; the thermostatic valve controls temperature

C. Both control oil pressure

23. A turbine compressor stall during rapid throttle movement reflects the fuel control needing to coordinate fuel with airflow, which a mechanic explains as:

A. Adding fuel slower than airflow always stalls the compressor

B. Adding fuel faster than the airflow can support causing a rich stall condition

C. The fuel control having no role in compressor stall

24. A mechanic ties together why an alternator is preferred over a generator and what regulates its output. The combined answer is:

A. The generator charges at idle and needs no regulation

B. The alternator needs no regulator and produces AC only

C. The alternator charges even at idle, and a regulator controls output by varying field current

25. A mechanic must explain why carburetor heat both removes ice and reduces power. The unifying reason is that the heated air is:

A. Denser, increasing power while melting ice

B. Less dense and warmer, melting ice but reducing the charge mass

C. Cooler, with no effect on power

26. A mechanic connects the concepts of geometric pitch, effective pitch, and slip. The accurate relationship is:

A. Slip is the difference between geometric and effective pitch

B. Effective pitch always exceeds geometric pitch

C. Slip equals the sum of geometric and effective pitch

27. A mechanic explains why a turbine engine is cooled largely by air and how this permits high gas temperatures. The integrated reasoning is:

A. The engine is liquid-cooled, limiting gas temperature to the metal's melting point

B. Secondary airflow and internal/film cooling of blades allow gas temperatures above the metal's limit

C. Oil circulates through the blades to cool them

28. A mechanic ties the magneto's independence from the electrical system to its reliability and to the hot-magneto hazard. The combined truth is:

A. The magneto depends on the battery, so it stops if the battery fails

B. The magneto is independent but cannot become a hazard

C. The magneto is self-powered (reliable) but a broken P-lead leaves it hot and dangerous

29. A mechanic explains why a turbine's net thrust is less than its gross thrust in flight. The accurate reasoning is:

A. The compressor stops in flight

B. The incoming air already has velocity, reducing the gas's velocity change

C. The exhaust gas cools to ambient temperature

30. A mechanic connects the roles of the boost pump in starting, backup, and vapor-lock prevention. The unifying purpose is that the boost pump:

A. Cools the fuel only

B. Provides fuel pressure independently of the engine-driven pump

C. Meters the fuel-air mixture automatically

31. A mechanic ties together why a hot start and a hung start are both start malfunctions but are diagnosed differently. The accurate distinction is:

A. Both are diagnosed by oil pressure

B. A hung start overtemperatures; a hot start fails to accelerate

C. A hot start exceeds EGT limits; a hung start stagnates at low RPM

32. A mechanic explains why a turbocharger is more efficient than a supercharger yet both restore altitude power. The combined reasoning is:

A. Both are gear-driven, with identical efficiency

B. Both compress induction air, but the turbocharger uses otherwise-wasted exhaust energy

C. The supercharger uses exhaust energy and is more efficient

33. A mechanic connects EGT trend monitoring to predictive maintenance of the hot section. The integrated view is:

A. EGT is irrelevant to hot-section condition

B. A slow EGT rise at constant thrust signals hot-section wear before a limit is reached

C. EGT only matters during the magneto check

34. A mechanic must explain why a single-row radial has an odd cylinder count and how this relates to firing order. The combined reason is:

A. An odd count lets the alternating firing sequence produce evenly spaced impulses

B. An even count is required for smooth firing

C. Cylinder count has no relation to firing order

35. A mechanic ties the purpose of dual ignition to both safety and performance. The accurate combined statement is:

A. It provides redundancy and creates two flame fronts for more complete combustion

B. It lowers the fuel octane requirement only

C. It exists solely to reduce cranking speed

36. A mechanic connects why oil must be inspected (filter cutting) and analyzed (spectrometric) for the same goal. The unifying purpose is to:

A. Increase oil pressure

B. Detect internal wear early by finding or trending metal

C. Reduce oil temperature

37. A mechanic explains why a turbine life limit is in cycles while engine condition is monitored in hours. The combined reasoning is:

A. Cycles and hours are interchangeable

B. Hours drive fatigue more than cycles

C. Each thermal cycle imposes a full fatigue load, so cycles govern life while hours track usage

38. A mechanic ties the venturi pressure drop and fuel vaporization to carburetor icing forming even on warm days. The integrated reason is:

A. Their combined cooling can drop carburetor temperature 30–40°F, freezing moisture

B. The venturi heats the air, causing ice

C. Fuel vaporization warms the air, preventing ice

39. A mechanic connects why an annual requires an IA but a 100-hour does not, despite identical scope. The accurate statement is:

A. The 100-hour is far more thorough than the annual

B. Both require an IA

C. They share scope but differ in trigger and sign-off authority, with the annual needing an IA

40. A mechanic explains why feathering reduces drag while reversing produces braking, both by changing blade angle. The combined truth is:

A. Both set the blade edge-on to the airflow

B. Both produce forward thrust

C. Feathering sets the blade near 90° to stop windmilling; reversing sets a negative angle for braking thrust

41. A mechanic ties together why a turbine engine needs a diffuser before the combustor. The integrated reasoning is:

A. The diffuser slows the air to its highest pressure and lowest velocity so combustion is stable

B. The diffuser accelerates the air to ignite it

C. The diffuser cools the air to prevent combustion

42. A mechanic connects the bonding strap's role to both electrical continuity and interference control. The combined purpose is to:

A. Support the engine's weight

B. Carry oil between the sump and cooler

C. Provide a low-resistance ground path and reduce static/radio interference

43. A mechanic must explain why a sodium-filled exhaust valve runs cooler and why it must never be cut open. The combined reasoning is:

A. The sodium hardens the valve and is inert

B. The sodium has no cooling role but is flammable

C. The sodium transfers heat from head to stem and reacts violently with moisture if exposed

44. A mechanic ties the function of the governor's flyweights to how a constant-speed prop holds RPM. The integrated statement is:

A. Flyweights sense speed and meter oil pressure to change blade angle

B. Flyweights meter fuel to the engine

C. Flyweights time the ignition spark

45. A mechanic connects why higher compression ratios improve power but demand higher-octane fuel. The combined reasoning is:

A. Higher compression lowers combustion temperature, needing lower octane

B. Higher compression raises pressure and temperature, requiring higher octane to resist detonation

C. Compression ratio has no relation to fuel grade

46. A mechanic explains why bleed valves and variable stator vanes both serve the compressor across its speed range. The unifying purpose is to:

A. Prevent compressor stall by managing airflow at different speeds

B. Increase the bypass ratio at cruise

C. Reduce exhaust noise on takeoff

47. A mechanic ties the purpose of a full-flow filter's bypass valve to the principle that oil starvation is worse than dirty oil. The combined statement is:

A. The bypass lets unfiltered oil through if the filter clogs, since some oil beats none

B. The bypass returns excess oil to the tank

C. The bypass regulates oil temperature

48. A mechanic connects why a turbine borescope inspection and a piston differential compression test serve the same diagnostic goal. The unifying purpose is to:

A. Time the engine ignition

B. Measure oil pressure

C. Assess internal condition without full disassembly

49. A mechanic explains why both impact icing and carburetor refrigeration icing are addressed by induction-system design. The combined reasoning is:

A. Alternate air handles a blocked intake/filter, while carb heat addresses refrigeration icing

B. Only carburetor heat is needed for all icing

C. Neither type of icing affects the induction system

50. A mechanic ties why turbine engines use synthetic oil while piston engines use mineral/AD oil. The integrated reason is:

A. Synthetic oil is cheaper and used everywhere

B. Synthetic oil withstands turbine high temperatures, while piston engines use mineral/AD oils not interchangeable with it

C. All engines use the same oil type

51. A mechanic connects the purpose of cowl flaps to the broader cooling system on a piston aircraft. The combined statement is:

A. Cowl flaps reverse the propeller

B. Cowl flaps regulate cooling airflow, complementing fins, baffles, and oil

C. Cowl flaps filter the induction air

52. A mechanic must explain why a thermocouple works for both engine instruments and one type of fire detection. The unifying principle is:

A. It measures pressure differences

B. It generates current by spinning

C. A junction of dissimilar metals produces a voltage related to temperature (or its rate of change)

53. A mechanic ties the role of secondary airflow in a turbine combustor to protecting the turbine. The integrated reasoning is:

A. Secondary air cools the liner and dilutes the gases to a turbine-tolerable temperature

B. Secondary air is the only air that burns

C. Secondary air bypasses the engine for thrust

54. A mechanic connects why an APU supplies both electrical power and bleed air and why it matters on the ground. The combined purpose is:

A. To provide cruise thrust

B. To make the aircraft self-sufficient without ground carts and enable main-engine starting

C. To drive only the landing gear

55. A mechanic explains why a rising EGT and rising fuel flow together at constant thrust point to one cause. The integrated reasoning is:

A. They indicate an overfilled oil tank

B. They indicate hot-section deterioration forcing the engine to work harder

C. They indicate a faulty fuel totalizer only

56. A mechanic ties why a propeller must be both in track and in balance to the goal of controlling vibration. The combined statement is:

A. Out-of-track or out-of-balance blades both cause harmful vibration

B. Tracking affects fuel flow; balance affects ignition

C. Neither affects vibration

57. A mechanic connects why fire detection and overheat detection serve complementary roles. The integrated view is:

A. They are identical systems

B. Overheat detection extinguishes fires

C. Overheat warns of abnormal temperature before a fire, while fire detection warns of an actual fire

58. A mechanic explains why a turbine engine's compressor discharge pressure is used by the fuel control. The combined reasoning is:

A. It measures the air mass available for combustion, so fuel can be scheduled safely

B. It measures oil pressure

C. It measures exhaust gas temperature

59. A mechanic ties why a magneto produces voltage on points-opening and why the capacitor matters. The integrated statement is:

A. Voltage forms when points close; the capacitor stores the spark

B. Voltage forms when points open and the field collapses; the capacitor speeds that collapse and protects the points

C. The capacitor generates the voltage directly

60. A mechanic connects why turbine blades use a fir-tree root and internal cooling for the same harsh environment. The combined reasoning is:

A. The root and cooling are unrelated to heat or load

B. The fir-tree root secures the blade against centrifugal load while allowing expansion, and cooling keeps it below gas temperature

C. The blade is uncooled and bolted directly

61. A mechanic explains why a four-stroke engine completes one cycle in two revolutions and produces one power impulse per cylinder. The integrated statement is:

A. Four strokes equal two revolutions, with one power stroke per cycle per cylinder

B. Four strokes equal one revolution, with two power impulses

C. Four strokes equal four revolutions, with no power impulse

62. A mechanic ties the camshaft's half-speed rotation to the valve timing of the four-stroke cycle. The combined reasoning is:

A. The camshaft turns at crankshaft speed because valves open every revolution

B. The camshaft turns at half speed because each valve opens once per two-revolution cycle

C. The camshaft turns at twice speed for redundancy

63. A mechanic connects why an exhaust leak in the heat-muff area is a life-safety issue. The integrated reasoning is:

A. Cabin heat is exhaust-warmed air, so a leak can carry carbon monoxide to occupants

B. The leak only reduces engine power

C. The leak increases cabin pressurization safely

64. A mechanic explains why thrust reversers are interlocked against in-flight deployment. The combined reasoning is:

A. In-flight reversal would be catastrophic, so the system is locked for ground use

B. Reversers increase takeoff thrust if deployed in flight

C. Reversers feather the fan in cruise

65. A mechanic ties why the impulse coupling both strengthens and retards the start spark. The integrated statement is:

A. It weakens the spark and advances timing

B. It only advances the timing with no spark effect

C. It snaps the magneto through the E-gap for a hot spark while retarding timing to prevent kickback

66. A mechanic connects why a turboprop needs a reduction gearbox while a turbojet does not. The combined reasoning is:

A. The turbojet drives a propeller directly

B. Both drive propellers at turbine speed

C. The turbine spins far faster than a propeller can use, so the turboprop needs reduction gearing

67. A mechanic explains why both magnetic particle and liquid penetrant exist as separate methods. The integrated reasoning is:

A. They are identical and interchangeable

B. Magnetic particle suits ferrous parts; penetrant suits nonmagnetic parts for surface flaws

C. Penetrant works only on ferrous parts

68. A mechanic ties why a wet-sump engine is simpler but a dry-sump tolerates aerobatics. The combined statement is:

A. Both store oil in an external tank

B. The wet-sump stores oil in the crankcase (simple); the dry-sump uses a tank, tolerating attitude changes

C. The dry-sump stores oil in the crankcase

69. A mechanic connects why an AD overrides a service bulletin when they conflict. The integrated reasoning is:

A. Service bulletins are always mandatory

B. Both are advisory

C. The AD carries the force of regulation, while the service bulletin is advisory unless incorporated by an AD

70. A mechanic explains why the diffuser and the turbine inlet represent the pressure and temperature peaks respectively. The combined statement is:

A. Both peaks occur at the exhaust

B. Pressure peaks at the turbine inlet; temperature at the diffuser

C. Pressure peaks at the diffuser; temperature peaks at the turbine inlet

71. A mechanic ties why preservation uses preservative oil and desiccant and why the engine must not be rotated. The integrated reasoning is:

A. Preservative oil and desiccant protect against corrosion, and rotating wipes off the protective film

B. Rotating improves preservation

C. Desiccant adds moisture to the engine

72. A mechanic connects why a turbofan's bypass air both produces thrust and reduces noise. The combined reasoning is:

A. Bypass air burns in the core to add thrust

B. The large, slower bypass stream provides efficient thrust and shrinks the jet velocity difference, lowering noise

C. Bypass air only cools the engine

73. A mechanic explains why a lean mixture is used for economy but risks detonation at high power. The integrated statement is:

A. Lean burns hotter and is economical at low power but can detonate at high power

B. Lean burns cooler and is always safe

C. Lean has more fuel than rich

74. A mechanic ties why both detonation (low octane) and pre-ignition (hot spot) must be prevented. The combined reasoning is:

A. Both cause severe overheating and engine damage despite differing timing

B. Both are harmless to the engine

C. Both occur only during the exhaust stroke

75. A mechanic connects why the firing order is engineered rather than arbitrary. The integrated reasoning is:

A. The firing order is random with no effect

B. The firing order only affects fuel economy

C. The firing order spaces power impulses evenly to minimize vibration

76. A mechanic explains why oil functions as a seal as well as a lubricant. The combined statement is:

A. Oil helps the rings seal against the cylinder wall while reducing friction

B. Oil only generates the ignition spark

C. Oil only filters contaminants

77. A mechanic ties why a turbine engine uses high-energy ignition only for starting. The integrated reasoning is:

A. Turbine combustion needs continuous spark like a piston engine

B. Combustion is self-sustaining after light-off, so ignition is needed only to start and relight

C. The igniters provide the engine's continuous thrust

78. A mechanic connects why critical altitude defines a boosted engine's performance ceiling for rated power. The combined statement is:

A. Above critical altitude the wastegate opens fully to maintain power

B. Critical altitude is where ignition becomes unnecessary

C. Critical altitude is the highest altitude rated manifold pressure can be maintained, above which power falls

79. A mechanic explains why both the intake and exhaust valves are timed relative to dead centers rather than exactly at them. The integrated reasoning is:

A. Valve timing has no relation to dead centers

B. The valves open and close exactly at the dead centers

C. Timing is advanced/retarded to use gas inertia for better filling and scavenging

80. A mechanic ties why a turbine engine's EGT, N1, N2, and fuel flow are read together. The combined statement is:

A. They are interpreted together as a pattern revealing engine condition

B. Only EGT matters and the rest are decorative

C. They each independently indicate oil pressure

81. A mechanic connects why a propeller nick must be blended and within limits. The integrated reasoning is:

A. The nick improves airflow and should be left

B. The nick should be welded to restore the profile

C. The nick is a stress riser that can cause fatigue failure, so it is blended within limits

82. A mechanic explains why both the annual and 100-hour inspections exist with identical scope. The combined statement is:

A. The annual covers only the engine and the 100-hour only the airframe

B. They differ in what triggers them and who signs them off, not in scope

C. The 100-hour is more thorough than the annual

83. A mechanic ties why a turbine's gas generator and free turbine can run at different speeds. The integrated reasoning is:

A. They are always mechanically locked together

B. The free turbine drives the compressor directly

C. The free turbine is not mechanically tied to the compressor, allowing independent speeds

84. A mechanic connects why fuel-air ratio is expressed by weight and why best power and best economy differ. The combined statement is:

A. Ratios are by volume, and best power equals best economy

B. Ratios are by weight, with best power richer and best economy leaner than stoichiometric... and they are identical

C. Ratios are by weight, with best power richer (~1:12) and best economy leaner (~1:16) than stoichiometric

85. A mechanic explains why a starter must disengage after the reciprocating engine starts. The integrated reasoning is:

A. The starter continues to drive the engine for power

B. Otherwise the running engine drives and destroys the starter

C. The starter must remain engaged to charge the battery

86. A mechanic ties why turbine engines are inspected by borescope through ports rather than teardown. The combined reasoning is:

A. Borescope inspection is less accurate than teardown and rarely used

B. Teardown is always required for any inspection

C. The borescope inspects internal sections of an assembled engine, saving teardown

87. A mechanic connects why a magneto's three circuits work together to produce a spark. The integrated statement is:

A. The magnetic circuit changes flux, the primary builds and collapses a field, and the secondary delivers high voltage

B. All three circuits independently produce the spark

C. Only the secondary circuit is involved

88. A mechanic explains why exceeding EGT during start damages the hot section. The combined reasoning is:

A. Overtemperature causes burning and accelerated creep of hot-section components

B. Overtemperature only reduces fuel economy

C. Overtemperature has no effect on the hot section

89. A mechanic ties why the mixture richens with altitude and why the mixture control exists. The integrated statement is:

A. The mixture leans with altitude and needs no control

B. The mixture control enriches the fuel as density rises

C. Decreasing air density richens the mixture, so the control leans it to maintain the ratio

90. A mechanic connects why an overheat detector typically uses a lower threshold than a fire detector. The combined reasoning is:

A. Overheat detection triggers at a higher temperature than fire detection

B. Overheat detection warns earlier of an abnormal temperature, such as a bleed-air leak, before a fire

C. Overheat and fire detection trigger at the same temperature

91. A mechanic explains why both the compressor and turbine consume or extract energy from the gas stream. The integrated statement is:

A. Both add energy to the gas

B. Both remove energy from the gas

C. The compressor adds energy to the air; the turbine extracts energy to drive the compressor

92. A mechanic ties why bleed air for engine anti-ice is hot and why ingested ice is dangerous. The combined reasoning is:

A. Cold bleed air is used and ice ingestion is harmless

B. Hot bleed air is unrelated to ice protection

C. Hot compressor bleed air keeps the inlet ice-free because ingested ice can damage the compressor

93. A mechanic connects why time in service (wheels-off to wheels-on) is the basis for hour limits. The integrated statement is:

A. Time in service is engine run time used for oil changes only

B. Time in service is the flight time that drives hour-based maintenance and life limits

C. Time in service is block-to-block time used for billing

94. A mechanic explains why a turbine combustor admits primary and secondary air in different proportions. The combined reasoning is:

A. Only the primary air burns, while the larger secondary stream cools and dilutes

B. All the air burns equally

C. Only the secondary air burns

95. A mechanic ties why both a hot plug and a cold plug exist for different engines. The integrated statement is:

A. They are identical and interchangeable

B. A hot plug suits cool engines (resists fouling); a cold plug suits hot engines (resists pre-ignition)

C. A hot plug suits hot engines and a cold plug suits cool engines

96. A mechanic connects why a turbine's thrust increases with mass airflow and velocity change. The integrated reasoning is:

A. Thrust is proportional to mass airflow times the velocity change of the gas

B. Thrust depends only on exhaust temperature

C. Thrust is independent of airflow

97. A mechanic explains why a major repair needs both Form 337 and approved data. The combined statement is:

A. The repair is documented on Form 337 and must use approved data to ensure airworthiness

B. Form 337 is optional and any data may be used

C. Approved data is needed but no form is required

98. A mechanic ties why a constant-speed prop adjusts blade angle on both overspeed and underspeed. The integrated reasoning is:

A. It changes fuel flow rather than blade angle

B. It coarsens the blade on overspeed and fines it on underspeed to hold RPM

C. It only changes blade angle on overspeed

99. A mechanic connects why a turbine's cold and hot sections suffer different defects. The combined statement is:

A. The cold section suffers FOD/erosion; the hot section suffers cracking, warping, and creep

B. Both sections suffer only FOD

C. The hot section suffers FOD and the cold section suffers creep

100. A mechanic explains why a reciprocating engine's oil pressure and temperature each have their own control. The integrated statement is:

A. Both pressure and temperature are controlled by the scavenge pump

B. The relief valve controls pressure and the cooler/thermostatic valve controls temperature

C. The oil pump controls both pressure and temperature

Answer Key & Full Answer Explanations

1. C — The piston engine's mixture needs time to burn so the spark leads TDC, while turbine combustion is continuous and self-sustaining after light-off. The piston spark fires before TDC because combustion takes finite time, while a turbine's continuous flame needs ignition only to start and relight.

2. A — Burns hotter, raising CHT and promoting end-gas detonation. A lean mixture burns hotter than a richer one, raising cylinder head temperature and promoting self-ignition of the end gases, which is detonation.

3. C — A failing bearing breaking down internally. Falling oil pressure, rising oil temperature, and metal on the chip detector together point to a bearing breaking down, which sheds metal and loses its oil film.

4. A — Wastegate failing to relieve exhaust to the turbine. A wastegate that fails to open drives the turbocharger to overboost, raising manifold pressure to detonation-inducing levels and stressing the engine.

5. A — The governor holding RPM by changing blade pitch while ice restricts airflow. With a constant-speed prop, the governor maintains RPM by adjusting pitch, so induction icing shows as a manifold-pressure drop rather than an RPM loss.

6. C — Large bypass stream moving more air at lower velocity. The high-bypass fan moves a large mass of air at lower velocity, which is both more efficient and quieter because it reduces the jet-to-ambient velocity difference.

7. B — Oil carries heat from internal parts, so its temperature and pressure together reveal internal condition. Oil is a major cooling medium, so reading its temperature and pressure together gives a picture of internal engine health.

8. B — Both lower performance and introduce carbon monoxide into the cabin. An exhaust crack can reduce performance and, because cabin heat comes from exhaust-warmed air, introduce carbon monoxide into the cabin.

9. C — Internal timing aligns points-opening to the E-gap; external timing sets the spark to the crankshaft position. Internal timing sets the points to open at the E-gap for the strongest spark, while external timing relates that spark to the crankshaft position.

10. A — The disk must be retired at its limit regardless of condition; the piston engine may run past TBO based on condition. A life-limited disk is mandatorily retired at its limit, while TBO is a recommendation allowing condition-based continuation.

11. A — Fuel is injected at the cylinder (no venturi cooling) but can vaporize in hot lines. Injecting fuel at the cylinder removes the venturi cooling that causes carburetor ice, but fuel can vaporize in hot lines, complicating hot starts.

12. B — Mass airflow and the change in gas velocity, both reduced by thin air or high inlet speed. Thrust depends on mass airflow and velocity change; thin air at altitude reduces mass flow, and high airspeed reduces the velocity change.

13. B — Rich provides best power and cooling for high load; lean provides best economy at lower power. A rich mixture gives best power and cooling for takeoff, while a leaner mixture gives best economy in cruise.

14. A — Hot and aerated, occupying more volume than the supplied oil. Scavenged oil is hot and foamy, occupying more volume, so the scavenge pump must have greater capacity than the pressure pump.

15. C — Detonation is uncontrolled burning after the spark; pre-ignition is ignition before the spark by a hot spot. Both overheat the engine, but detonation occurs after the normal spark while pre-ignition occurs before it from a hot spot.

16. B — Compressor air that would otherwise contribute to thrust. Bleed air is tapped from the compressor, so extracting it removes air that could have produced thrust, slightly reducing engine output.

17. C — Fins shed heat to cooling air directed by baffles, while oil carries heat from internal parts. Thermal management combines fins shedding heat to baffle-directed cooling air with oil carrying heat from internal parts.

18. B — Highest pressure at the diffuser; highest temperature at the turbine inlet. Pressure peaks at the diffuser before the combustor, while temperature peaks at the turbine inlet—two distinct locations.

19. C — The blade is twisted because the tip moves faster, and centrifugal force is the largest force on the rotating blade. The twist keeps the angle of attack uniform since the tip moves faster, and centrifugal force is the dominant force trying to pull the blades out.

20. C — The exhaust valve is leaking, since air escapes at the exhaust pipe. A 60/80 reading with air heard at the exhaust pipe diagnoses a leaking exhaust valve; the breather would indicate rings and the intake an intake valve.

21. A — Stores high electrical energy that must be allowed to bleed down. A turbine ignition exciter stores dangerous high electrical energy even after power is removed, so it must bleed down before service.

22. B — The relief valve controls pressure; the thermostatic valve controls temperature. Oil pressure is regulated by the relief valve and oil temperature by the cooler's thermostatic valve—two separate controls.

23. B — Adding fuel faster than the airflow can support causing a rich stall condition. A rapid throttle advance can add fuel faster than the compressor airflow can support, causing a stall, which the fuel control must coordinate against.

24. C — The alternator charges even at idle, and a regulator controls output by varying field current. An alternator charges at idle unlike a DC generator, and a voltage regulator controls its output by varying field current.

25. B — Less dense and warmer, melting ice but reducing the charge mass. Carburetor heat supplies warm, less dense air that melts ice but reduces power and richens the mixture.

26. A — Slip is the difference between geometric and effective pitch. Geometric pitch is the theoretical advance and effective pitch the actual advance; slip is the difference, representing the propeller's loss in air.

27. B — Secondary airflow and internal/film cooling of blades allow gas temperatures above the metal's limit. Turbines are air-cooled by secondary airflow and internal/film cooling, which lets gas temperatures exceed the blade material's own limit.

28. C — The magneto is self-powered (reliable) but a broken P-lead leaves it hot and dangerous. The magneto's independence makes it reliable, but a broken P-lead prevents grounding, leaving it hot and the propeller dangerous.

29. B — The incoming air already has velocity, reducing the gas's velocity change. Net thrust in flight is lower than gross static thrust because the air enters already moving, reducing the velocity change that produces thrust.

30. B — Provides fuel pressure independently of the engine-driven pump. The boost pump provides fuel pressure independent of the engine-driven pump, serving start, backup, and vapor-lock prevention.

31. C — A hot start exceeds EGT limits; a hung start stagnates at low RPM. A hot start is an overtemperature, while a hung start lights off but fails to accelerate, stabilizing at low RPM—distinguished by EGT and RPM.

32. B — Both compress induction air, but the turbocharger uses otherwise-wasted exhaust energy. Both restore altitude power by compressing induction air, but the turbocharger is more efficient because it recovers exhaust energy.

33. B — A slow EGT rise at constant thrust signals hot-section wear before a limit is reached. Trend monitoring catches a slow EGT rise at constant thrust as a sign of hot-section wear, enabling predictive maintenance.

34. A — An odd count lets the alternating firing sequence produce evenly spaced impulses. A single-row radial needs an odd cylinder count so its alternating firing sequence produces evenly spaced power impulses.

35. A — It provides redundancy and creates two flame fronts for more complete combustion. Dual ignition gives a backup if one system fails and improves combustion with two flame fronts for faster, more complete burning.

36. B — Detect internal wear early by finding or trending metal. Both filter cutting and spectrometric analysis aim to detect internal wear early by finding or trending metal particles.

37. C — Each thermal cycle imposes a full fatigue load, so cycles govern life while hours track usage. Life limits are in cycles because each thermal cycle imposes a full fatigue load on rotating parts, while hours track general usage.

38. A — Their combined cooling can drop carburetor temperature 30–40°F, freezing moisture. The venturi pressure drop plus fuel vaporization can cool the carburetor 30–40°F, freezing moisture even on warm days.

39. C — They share scope but differ in trigger and sign-off authority, with the annual needing an IA. The annual and 100-hour have identical scope but differ in trigger and sign-off; the annual requires an IA.

40. C — Feathering sets the blade near 90° to stop windmilling; reversing sets a negative angle for braking thrust. Both change blade angle, but feathering goes edge-on to cut drag while reversing goes negative for braking thrust.

41. A — The diffuser slows the air to its highest pressure and lowest velocity so combustion is stable. The diffuser slows the air to its lowest velocity and highest pressure so fuel can burn stably in the combustor.

42. C — Provide a low-resistance ground path and reduce static/radio interference. The bonding strap provides electrical continuity between engine and airframe, controlling static and radio interference.

43. C — The sodium transfers heat from head to stem and reacts violently with moisture if exposed. The sodium carries heat from the valve head to the stem but reacts violently with moisture if the valve is cut open.

44. A — Flyweights sense speed and meter oil pressure to change blade angle. The governor's flyweights sense engine speed and position a valve metering oil pressure to the pitch-change mechanism, holding RPM.

45. B — Higher compression raises pressure and temperature, requiring higher octane to resist detonation. A higher compression ratio raises combustion pressure and temperature, demanding higher-octane fuel to resist detonation.

46. A — Prevent compressor stall by managing airflow at different speeds. Bleed valves and variable stator vanes both manage compressor airflow across the speed range to prevent stall.

47. A — The bypass lets unfiltered oil through if the filter clogs, since some oil beats none. The bypass valve passes unfiltered oil when the filter clogs, because oil starvation is far more harmful than dirty oil.

48. C — Assess internal condition without full disassembly. Both the turbine borescope and the piston differential compression test assess internal condition without full disassembly.

49. A — Alternate air handles a blocked intake/filter, while carb heat addresses refrigeration icing. The induction system uses alternate air for a blocked intake or filter and carburetor heat for refrigeration icing.

50. B — Synthetic oil withstands turbine high temperatures, while piston engines use mineral/AD oils not interchangeable with it. Turbines use synthetic oil for high-temperature stability, while piston engines use mineral/AD oils that are not interchangeable.

51. B — Cowl flaps regulate cooling airflow, complementing fins, baffles, and oil. Cowl flaps control the volume of cooling air, working with the fins, baffles, and oil in the engine's thermal management.

52. C — A junction of dissimilar metals produces a voltage related to temperature (or its rate of change). A thermocouple's dissimilar-metal junction produces a voltage related to temperature, used for instruments and rate-of-rise fire detection.

53. A — Secondary air cools the liner and dilutes the gases to a turbine-tolerable temperature. Secondary airflow cools the combustor liner and dilutes the combustion gases to a temperature the turbine can withstand.

54. B — To make the aircraft self-sufficient without ground carts and enable main-engine starting. The APU supplies electrical power and bleed air so the aircraft needs no ground carts and can start its main engines.

55. B — They indicate hot-section deterioration forcing the engine to work harder. A simultaneous rise in EGT and fuel flow at constant thrust indicates hot-section deterioration making the engine work harder.

56. A — Out-of-track or out-of-balance blades both cause harmful vibration. Both out-of-track and out-of-balance propeller conditions cause harmful vibration, so both track and balance must be correct.

57. C — Overheat warns of abnormal temperature before a fire, while fire detection warns of an actual fire. Overheat detection gives earlier warning of an abnormal temperature, complementing fire detection's warning of an actual fire.

58. A — It measures the air mass available for combustion, so fuel can be scheduled safely. Compressor discharge pressure indicates the air mass available, letting the fuel control schedule fuel without exceeding limits.

59. B — Voltage forms when points open and the field collapses; the capacitor speeds that collapse and protects the points. The high voltage is induced when the points open and the primary field collapses, with the capacitor speeding the collapse and protecting the points.

60. B — The fir-tree root secures the blade against centrifugal load while allowing expansion, and cooling keeps it below gas temperature. The fir-tree root holds the blade against centrifugal load and permits thermal expansion, while internal cooling keeps it below gas temperature.

61. A — Four strokes equal two revolutions, with one power stroke per cycle per cylinder. A four-stroke engine completes its cycle in two revolutions, producing one power impulse per cylinder per cycle.

62. B — The camshaft turns at half speed because each valve opens once per two-revolution cycle. The camshaft turns at half crankshaft speed since each valve opens once per two-revolution four-stroke cycle.

63. A — Cabin heat is exhaust-warmed air, so a leak can carry carbon monoxide to occupants. Because cabin heat comes from exhaust-warmed air, an exhaust leak in the heat-muff area can carry carbon monoxide to the occupants.

64. A — In-flight reversal would be catastrophic, so the system is locked for ground use. Thrust reversers are interlocked against in-flight deployment because an in-flight reversal would be catastrophic.

65. C — It snaps the magneto through the E-gap for a hot spark while retarding timing to prevent kickback. The impulse coupling snaps the magneto through the E-gap for a strong spark and retards the timing to prevent kickback during start.

66. C — The turbine spins far faster than a propeller can use, so the turboprop needs reduction gearing. A turboprop needs a reduction gearbox because the turbine spins far faster than a propeller can efficiently turn; a turbojet drives no propeller.

67. B — Magnetic particle suits ferrous parts; penetrant suits nonmagnetic parts for surface flaws. Magnetic particle works on ferromagnetic parts, while liquid penetrant works on nonmagnetic parts for surface-breaking flaws.

68. B — The wet-sump stores oil in the crankcase (simple); the dry-sump uses a tank, tolerating attitude changes. The wet-sump is simple, storing oil in the crankcase, while the dry-sump uses an external tank and tolerates aerobatic attitudes.

69. C — The AD carries the force of regulation, while the service bulletin is advisory unless incorporated by an AD. An AD is mandatory and overrides a conflicting service bulletin, which is advisory unless an AD incorporates it.

70. C — Pressure peaks at the diffuser; temperature peaks at the turbine inlet. The diffuser is the point of highest pressure and the turbine inlet the point of highest temperature.

71. A — Preservative oil and desiccant protect against corrosion, and rotating wipes off the protective film. Preservation uses preservative oil and desiccant against corrosion, and rotating the engine wipes off the protective film, so it must not be turned.

72. B — The large, slower bypass stream provides efficient thrust and shrinks the jet velocity difference, lowering noise. The slower bypass stream provides efficient thrust and reduces the jet-to-ambient velocity difference, lowering noise.

73. A — Lean burns hotter and is economical at low power but can detonate at high power. A lean mixture is economical and burns hotter, which is acceptable at low power but risks detonation at high power.

74. A — Both cause severe overheating and engine damage despite differing timing. Detonation and pre-ignition both cause severe overheating and damage, differing only in whether ignition is after or before the spark.

75. C — The firing order spaces power impulses evenly to minimize vibration. The firing order is engineered to distribute power impulses evenly around the crankshaft, minimizing vibration.

76. A — Oil helps the rings seal against the cylinder wall while reducing friction. Oil seals the piston rings against the cylinder wall as well as lubricating, among its several functions.

77. B — Combustion is self-sustaining after light-off, so ignition is needed only to start and relight. Turbine combustion sustains itself once lit, so high-energy ignition is needed only for starting and relight.

78. C — Critical altitude is the highest altitude rated manifold pressure can be maintained, above which power falls. Critical altitude marks the ceiling for rated power; above it, a boosted engine can no longer hold rated manifold pressure and power falls.

79. C — Timing is advanced/retarded to use gas inertia for better filling and scavenging. Valve timing is advanced and retarded relative to the dead centers to use gas inertia for improved cylinder filling and scavenging.

80. A — They are interpreted together as a pattern revealing engine condition. EGT, N1, N2, and fuel flow are read together as a pattern that reveals overall engine condition.

81. C — The nick is a stress riser that can cause fatigue failure, so it is blended within limits. A propeller nick concentrates stress and can initiate a fatigue crack, so it is blended smooth within manufacturer limits.

82. B — They differ in what triggers them and who signs them off, not in scope. The annual and 100-hour inspections have identical scope and differ only in trigger and sign-off authority.

83. C — The free turbine is not mechanically tied to the compressor, allowing independent speeds. A free turbine is not mechanically connected to the compressor, so the gas generator and free turbine can run at different speeds.

84. C — Ratios are by weight, with best power richer (~1:12) and best economy leaner (~1:16) than stoichiometric. Fuel-air ratios are by weight, with best power around a rich 1:12 and best economy around a lean 1:16 relative to stoichiometric ~1:15.

85. B — Otherwise the running engine drives and destroys the starter. The starter must disengage after start so the running engine does not drive the starter backward and destroy it.

86. C — The borescope inspects internal sections of an assembled engine, saving teardown. The borescope inspects the compressor, combustor, and turbine of an assembled engine through ports, avoiding teardown.

87. A — The magnetic circuit changes flux, the primary builds and collapses a field, and the secondary delivers high voltage. The three magneto circuits work together: the magnetic circuit changes flux, the primary builds then collapses a field, and the secondary delivers the high voltage.

88. A — Overtemperature causes burning and accelerated creep of hot-section components. Exceeding EGT during start can burn hot-section components and accelerate creep, which is why a hot start triggers inspection.

89. C — Decreasing air density richens the mixture, so the control leans it to maintain the ratio. As air density falls with altitude, the mixture richens, so the mixture control leans the fuel to maintain the proper ratio.

90. B — Overheat detection warns earlier of an abnormal temperature, such as a bleed-air leak, before a fire. An overheat detector uses a lower threshold to warn earlier of an abnormal temperature, like a bleed-air leak, before a full fire.

91. C — The compressor adds energy to the air; the turbine extracts energy to drive the compressor. The compressor adds energy to compress the air, while the turbine extracts energy from the hot gas to drive the compressor.

92. C — Hot compressor bleed air keeps the inlet ice-free because ingested ice can damage the compressor. Hot bleed air is ducted to the inlet to prevent ice, since ingested ice can damage the compressor.

93. B — Time in service is the flight time that drives hour-based maintenance and life limits. Time in service is wheels-off to wheels-on flight time, the basis for hour-based maintenance and life limits.

94. A — Only the primary air burns, while the larger secondary stream cools and dilutes. Primary air mixes with fuel and burns, while the larger secondary stream cools the liner and dilutes the gases.

95. B — A hot plug suits cool engines (resists fouling); a cold plug suits hot engines (resists pre-ignition). A hot plug dissipates heat slowly and resists fouling in cool engines, while a cold plug dissipates heat quickly and resists pre-ignition in hot engines.

96. A — Thrust is proportional to mass airflow times the velocity change of the gas. Turbine thrust is proportional to mass airflow times the change in gas velocity, so increasing either increases thrust.

97. A — The repair is documented on Form 337 and must use approved data to ensure airworthiness. A major repair is documented on Form 337 and accomplished using approved data to ensure airworthiness.

98. B — It coarsens the blade on overspeed and fines it on underspeed to hold RPM. The constant-speed governor coarsens the blade on overspeed and fines it on underspeed to maintain the selected RPM.

99. A — The cold section suffers FOD/erosion; the hot section suffers cracking, warping, and creep. The cold section's chief defects are FOD and erosion, while the hot section suffers heat-driven cracking, warping, and creep.

100. B — The relief valve controls pressure and the cooler/thermostatic valve controls temperature. Oil pressure is controlled by the relief valve and oil temperature by the cooler and its thermostatic valve—two separate controls.