

U.S.C.G. Merchant Marine Exam

DDE – Unlimited HP

Q622 Gas Turbine Plants

(Sample Examination)

Choose the best answer to the following Multiple-Choice Questions.

1. Compared to other types of engines, what is the biggest advantage of a gas turbine engine?

- A. Simplicity of installation
- B. Simplicity of the control circuits
- C. Low power-to-weight ratio
- D. Highest power-to-weight ratio

Correct answer: D

2. The thermal energy added to the gas as it flows through the combustion section has what effect on the gas?

- A. Decreases volume
- B. Decreases pressure
- C. Increases volume
- D. Increases pressure

Correct answer: C

3. Why is a gas turbine considered to operate on the Brayton cycle?

- A. Combustion occurs with no increase in pressure.
- B. Combustion causes no increase in volume.
- C. Combustion causes large increase in pressure.
- D. Combustion causes an increase in total mass flow.

Correct answer: A

4. In a gas turbine, the air charge is permitted to be compressed adiabatically by what factor, process, or condition?

- A. Rapid heat transfer
- B. Speed of the process
- C. Low-compression ratio
- D. Interstage cooling

Correct answer: B

5. An open cycle gas turbine engine is best described by which of the following statements?

- A. Working fluids are taken in, transformed, and then recuperated.
- B. Working fluids are taken in, transformed, and then discarded.
- C. Energy is added externally.
- D. Energy is neither created nor destroyed and the cycle is therefore perpetual.

Correct answer: B

6. The acronym CDP stands for which of the following?

- A. Compressor Discharge Pressure.
- B. Coupling Disassembly Point.
- C. Compressor Discharge Pyrometer.
- D. Choke Down Point.

Correct answer: A

7. The acronym FOD stands for which of the following?

- A. Fuel oil discharge
- B. Foreign object damage
- C. Flow offset design
- D. Fuel override demand

Correct answer: B

8. What is the term given to a process that occurs without a loss or gain of heat?

- A. Endothermic
- B. Exothermic
- C. Isothermal
- D. Adiabatic

Correct answer: D

9. Kelvin is the absolute temperature scale that corresponds to which of the following?

- A. Absolute reading of a measured temperature in degrees Rankine.
- B. Absolute reading of a measured temperature in degrees Fahrenheit.
- C. Absolute reading of a measured temperature in degrees Celsius.
- D. None of the above.

Correct answer: C

10. A temperature of 32.5 degrees Celsius converts to approximately what temperature in degrees Kelvin?

- A. 240.5 degrees K.
- B. 305.5 degrees K.
- C. 492.5 degrees K.
- D. 427.5 degrees K.

Correct answer: B

11. A temperature of 69.5 degrees Fahrenheit converts to approximately what temperature in degrees Rankine?

- A. 529.5 degrees R.
- B. 342.5 degrees R.
- C. 203.5 degrees R.
- D. 590.5 degrees R.

Correct answer: A

12. A centrifugal compressor assembly consists of which of the following?

- A. A rotating impeller and a stationary diffuser
- B. Rotating pistons and stationary liners
- C. Stationary vanes and rotating blades
- D. A stationary impeller and a rotating diffuser

Correct answer: A

13. While air is being compressed in a centrifugal flow gas turbine, what happens to the direction of air flow?

- A. Changes only once from inlet to outlet
- B. Changes only at the compressor discharge
- C. Changes at each separate component
- D. Changes only at the compressor inlet

Correct answer: C

14. The purpose of the metal spray rub coating on the rotor and stator casing of an axial type compressor is which of the following?

- A. Provide close vane to rotor and blade to stator case clearances
- B. Control air flow through the compressor
- C. Seal the circumferential dovetails
- D. Ensure protection for the gearbox adapter when removing or replacing the bearings

Correct answer: A

15. Each stage of an axial compressor of a gas turbine can compress the atmospheric air a total of how many times?

- A. 1.2 times
- B. 2.2 times
- C. 3.2 times
- D. 4.2 times

Correct answer: A

16. What is the function of the stator in an axial gas turbine compressor?

- A. To convert pressure to velocity.
- B. To increase volume.
- C. To convert velocity to pressure.
- D. To provide velocity energy.

Correct answer: C

17. What is the term used to describe the stationary vanes preceding the first stage of an axial compressor?

- A. Variable inlet vanes
- B. First stage stator vanes
- C. Inlet guide vanes
- D. Variable stator vanes

Correct answer: C

18. Two functions of the compressor stator vanes include which of the following?

- A. Direct air flow to rotor blades at the correct angle and are shaped to produce a velocity increase and maintain a constant pressure.
- B. Direct air flow to rotor blades at the correct angle and are shaped to cause a velocity increase and a pressure decrease.
- C. Direct air flow to each rotor stage at the correct angle and deliver air to the combustor at the correct velocity and pressure.
- D. Direct air flow to rotor blades at the correct angle and are shaped to maintain a constant velocity and produce a pressure increase.

Correct answer: C

19. Which of the following statements is true concerning axial compressor disk-type rotors?

- A. Rotor is only suitable for low-speed compressors.
- B. Rotor discs are shrunk fit onto a steel shaft.
- C. Rotor discs are held together by through bolts.
- D. Rotor consists of rings that are flanged to fit one against the other.

Correct answer: B

20. Why are loose-fitting blades used on the first several stages of large axial compressors?

- A. To compensate for a malfunctioning compressor support bearing
- B. To compensate for the abrasive action of the blade tips
- C. To maintain close tolerances in the compressor
- D. To minimize vibration while the engine is passing through critical speed ranges

Correct answer: D

21. In a gas turbine engine, the majority of the energy is added to the working fluid in which of the following components?

- A. Compressor
- B. Combustor
- C. High-pressure turbine
- D. Power turbine

Correct answer: B

22. A centrifugal flow gas turbine uses what type of combustion chamber?

- A. Double-annular
- B. Can-annular
- C. Annular
- D. Can

Correct answer: D

23. The three most common types of combustors used in gas turbine engines are which of the following?

- A. Can, angular, and can-angular.
- B. Can, annular, and can-annular.
- C. Can, vortex, and can-vortex.
- D. Can, derivative, and can-derivative.

Correct answer: B

24. How do the high-velocity high-temperature gases cause the gas turbine rotor to rotate?

- A. By increasing the velocity of the gases.
- B. By transferring velocity energy and thermal energy to the turbine blades.
- C. By converting the high-velocity gas to low-velocity gas.
- D. By creating a low-pressure area before the rotor.

Correct answer: B

25. The turbine nozzles convert heat and pressure energy to velocity energy by means of which of the following?

- A. Convergent-divergent process
- B. Convergent process
- C. Divergent process
- D. Deflection process

Correct answer: B

26. What method is utilized to allow turbine nozzle blades to withstand high inlet temperatures?

- A. Laser cooling
- B. Air cooling
- C. Thermoelectric cooling
- D. Water cooling

Correct answer: B

27. What are the two principal functions of the turbine nozzle guide vanes?

- A. Convert the potential energy of the hot gases into heat energy and direct the flow of gases to the turbine rotor blades.
- B. Convert the heat energy of the hot gases into potential energy and direct the flow of gases to the turbine rotor blades.
- C. Convert the heat energy of the hot gases into kinetic energy and direct the flow of gases to the turbine rotor blades.
- D. Convert the heat energy of the hot gases into potential energy and direct the flow of gases to the compressor rotor blades.

Correct answer: C

28. To keep the exit pressures relatively constant across a HP turbine blade, which type of construction is generally utilized?

- A. Impulse.
- B. Rateau.
- C. Curtis.
- D. Impulse-Reaction.

Correct answer: D

29. Turbine disks are commonly attached to the shaft by which of the following methods?

- A. Pinned or locking tabs
- B. Bolted or welded
- C. Riveted or pinned
- D. Locking tabs or retaining rings

Correct answer: B

30. Which of the following is an advantage of a single-shaft gas turbine engine compared to a split-shaft gas turbine engine?

- A. Fewer moving parts
- B. Reversible
- C. Better fuel economy
- D. Lower starting torque

Correct answer: A

31. What type of seal is used in the gearbox of a gas turbine engine?

- A. Fishmouth
- B. Carbon ring
- C. Lip-type
- D. Labyrinth-Windback

Correct answer: B

32. What is the purpose of the spring in a lip-type oil seal?

- A. To keep the neoprene snugly fit around the shaft
- B. To seal against maximum fluid pressure
- C. To remove burrs and dirt from the shaft
- D. To prevent air from entering the sump

Correct answer: A

33. What is the purpose of the air/oil separator shown in the illustration of the gas turbine lube oil system?
Illustration GT-0024

- A. Minimize oil consumption by separating oily vapors being vented to the atmosphere
- B. Reduce oil foaming
- C. Maintain oil pressure in the sumps
- D. All of the above

Correct answer: A

34. What type of starter is commonly used on smaller gas turbine engines?

- A. Air turbine
- B. Pneumatic
- C. Electric
- D. Hydraulic

Correct answer: C

35. In the ignition system of a gas turbine engine, how is optimum spark achieved?

- A. Concentration of minimum energy in maximum time
- B. Concentration of minimum energy in minimum time
- C. Concentration of maximum energy in maximum time
- D. Concentration of maximum energy in minimum time

Correct answer: D

36. When the main reduction gear lube oil system is secured, which of the following components maintains the air within the casing at less than 35 percent relative humidity?

- A. Reciprocator
- B. Rehumidifier
- C. Dehumidifier
- D. Precipitator

Correct answer: C

37. How is the lube oil supplied to each bearing in a gas turbine engine controlled?

- A. Regulating valve
- B. Flow divider
- C. Calibrated orifice
- D. Lube oil pump

Correct answer: C

38. The electrostatic vent fog precipitator removes oil mist from which of the following areas?

- A. Main reduction gear
- B. Gas turbine engine
- C. Lube oil storage tank
- D. Synchronous self-shifting clutch

Correct answer: A

39. On the marine gas turbine engine shown in the illustration, the 8th stage bleed air is used for which of the following? Illustration GT-0017

- A. High-pressure turbine 2nd stage nozzle cooling
- B. Lube oil sump pressurization and cooling
- C. Power turbine blade cooling
- D. Power turbine balance piston cavity pressurization

Correct answer: B

40. The lube oil system shown in the illustration is designed to lubricate the main bearings by what principle?
Illustration GT-0023

- A. Splash lubrication
- B. Self-contained partial oil bath
- C. Spray lubrication with dry sumps
- D. Totally submerged oil bath

Correct answer: C

41. As shown in the illustration, what is the purpose of pressurizing the main bearing lube oil sumps on a typical marine gas turbine? Illustration GT-0023

- A. Assists in cooling the lube oil.
- B. Minimizes oil leakage from the rotor shaft.
- C. Increases lube oil penetration.
- D. Provides uniform lube oil distribution around the bearing.

Correct answer: B

42. Air used to cool the combustion liners and turbine components is referred to as which of the following?

- A. Secondary air
- B. Control air
- C. Primary air
- D. None of the above

Correct answer: A

43. The fuel oil system of a gas turbine engine provides all EXCEPT which of the following?

- A. Acts as a cooling medium for the lube oil cooler
- B. Controls the angle of the variable stator vanes
- C. Acts as a hydraulic medium to actuate the fuel control
- D. Provides accurately metered fuel for combustion

Correct answer: A

44. How do you manually lockout an SSS clutch?

- A. Using the special wrench provided
- B. Remove the SSS clutch locking pawls
- C. Calculate the engagement speed of the SSS clutch
- D. Using air pressure

Correct answer: A

45. Which of the following statements is true about the "lockout control" on a synchronous self-shifting (SSS) clutch?

- A. Permits operation of the GTE without the rotation of the main reduction gear.
- B. The mechanism is incorporated into the input assembly of the clutch.
- C. It is an automatically operated control.
- D. None of the above.

Correct answer: A

46. What type of main reduction gear arrangement prevents independent axial and rotational movement of the pinions?

- A. Independent suspension
- B. Locked train
- C. Unlocked train
- D. Hydraulic suspension

Correct answer: B

47. What feature is commonly used on articulated reduction gear arrangements for the correction of misalignment between the 1st reduction gear and the 2nd reduction pinions?

- A. Quill shafts
- B. Fixed block pads
- C. Torsion pads
- D. Locked train shims

Correct answer: A

48. What is the purpose of the Controllable-Pitch Propeller (CPP) hydraulic oil power system?

- A. Supplies high-pressure oil for blade actuation and control oil for propeller pitch control.
- B. Supplies high-pressure oil for both propeller blade actuation and stern tube sealing.
- C. Supplies low-pressure oil for propeller blade actuation and control oil for propeller pitch control.
- D. Supplies low-pressure oil for both pitch control and stern tube sealing.

Correct answer: A

49. A magnet pickup typically produces what type of signal output?

- A. pure sine wave
- B. voltage pulse
- C. high current
- D. steady DC voltage

Correct answer: B

50. Compressor characteristics are normally summarized in the form of which of the following?

- A. Spread sheet
- B. Venn diagram
- C. Compressor map
- D. Straight line graph

Correct answer: C

51. Which of the following conditions permits a gas turbine to produce 100% power?

- A. Minimum air mass/weight flow
- B. Minimum air inlet temperature
- C. Maximum fuel flow
- D. Maximum combustion temperature

Correct answer: B

52. Which of the following are the principal factors that affect the performance of a gas turbine compressor?

- A. Fuel flow, air flow, exhaust temperature
- B. Pressure ratio, air flow, rotational speed
- C. Bleed pressure, fuel pressure, exhaust temperature
- D. None of the above

Correct answer: B

53. The only hand tools that should be used on gas turbine engines are chrome plated, nickel plated, or which of the following?

- A. Bronze plated
- B. Unplated
- C. Silver plated
- D. Cadmium plated

Correct answer: B

54. When conducting a borescope inspection, you must be aware of all of the following factors EXCEPT which?

- A. The inspection areas and ports.
- B. The engineer's experience.
- C. The internal reference points.
- D. The limitations of your equipment.

Correct answer: B

55. Which of the following wrenches should NOT be used while working on a gas turbine?

- A. Crowfoot wrench
- B. Flare nut wrench
- C. Adjustable wrench
- D. Box wrench

Correct answer: C

56. What are the two primary sources of deposits that build up on compressor blades?

- A. Salt spray and lube oil mist
- B. Lube oil mist and carbon residue
- C. Lube oil mist and dry particulate matter
- D. Salt spray and carbon residue

Correct answer: A

57. While standing watch underway on a ship with the gas turbine shown in the illustration, a fire emergency stop is initiated when which of the following occurs? Illustration GT-0017

- A. The fire emergency shutdown switch located on the gas turbine module is activated.
- B. Either the primary or reserve gas turbine module CO2 system activates.
- C. One of the UV flame detectors is activated.
- D. All of the above.

Correct answer: D

58. The two main types of compressor stall are known as what?

- A. Steady state and transient
- B. Flame out and inlet temperature stall
- C. Overspeed and overload stall
- D. Rapid rise and temperature inversion

Correct answer: A

59. What is the term given to the condition in which cyclic pressure changes result in a repetitive failure and recovery of compressor air flow?

- A. Stall
- B. Surge
- C. Turbulence
- D. Laminar

Correct answer: B

60. When a compressor is in a stall condition, what will happen to the combustor and turbine temperatures?

- A. Rapidly decrease
- B. Rapidly increase
- C. Slowly increase
- D. Slowly decrease

Correct answer: B

61. If the lube oil scavenge temperature exceeds 300 degrees Fahrenheit on the gas turbine engine shown in the illustration, and reducing power does NOT bring the temperature within limits, the operator should do which of the following? Illustration GT-0017

- A. Shutdown the engine and troubleshoot.
- B. Continue to reduce power on the engine.
- C. Continue to operate at the reduced power level.
- D. Monitor the temperature while continuing to operate.

Correct answer: A

62. How is the HP turbine rotor of the GE LM2500 gas turbine cooled?

- A. By a continuous flow of compressor discharge air
- B. By the ship's service sea water cooling system
- C. By an air-to-air heat exchanger
- D. By synthetic lube oil

Correct answer: A

63. What type of combustor is used by the GE LM2500 gas turbine?

- A. Cannular
- B. Annular
- C. Can
- D. Can-annular

Correct answer: B

64. The struts of the GE LM2500 compressor front frame provide passages for all of the following mediums EXCEPT which of the following?

- A. Fuel oil
- B. Scavenge oil
- C. Lube oil
- D. Seal-pressurization air

Correct answer: A

65. The gas generator section of the GE LM2500 gas turbine is composed of all of the following components EXCEPT which of the following?

- A. Two-stage HP turbine
- B. FOD screen
- C. Bellmouth
- D. Six-stage LP turbine

Correct answer: D

66. Which of the following statements is true concerning the fuel oil ignition system of the gas turbine engine shown in the illustration? Illustration GT-0017

- A. The igniters remain energized throughout the normal operation of the engine.
- B. The igniters will only energize if the exhaust gas temperature falls below a preset value.
- C. The igniters will de-energize when the power turbine exceeds a preset RPM.
- D. The igniters will de-energize when the gas generator exceeds a preset RPM.

Correct answer: D

67. What is the primary function of the main fuel control on the GE LM2500 gas turbine engine?

- A. To control fuel pump inlet pressure
- B. To control stator vane angle and bleed air discharge
- C. To control fuel temperature
- D. To control stator vane angle and GG speed

Correct answer: D

68. For the GE LM2500 gas turbine engine shown in the illustration, the 13th stage bleed air is used for which of the following? Illustration GT-0017

- A. High-pressure turbine 2nd stage nozzle cooling
- B. Sump pressurization and cooling
- C. Power turbine cooling
- D. Power turbine balance piston cavity pressurization

Correct answer: A

69. For the GE LM2500 gas turbine engine shown in the illustration, the HP turbine 1st stage nozzle vanes are cooled by which of the following? Illustration GT-0020

- A. 8th stage compressor air
- B. 9th stage compressor air
- C. 13th stage compressor air
- D. 16th stage compressor air

Correct answer: D

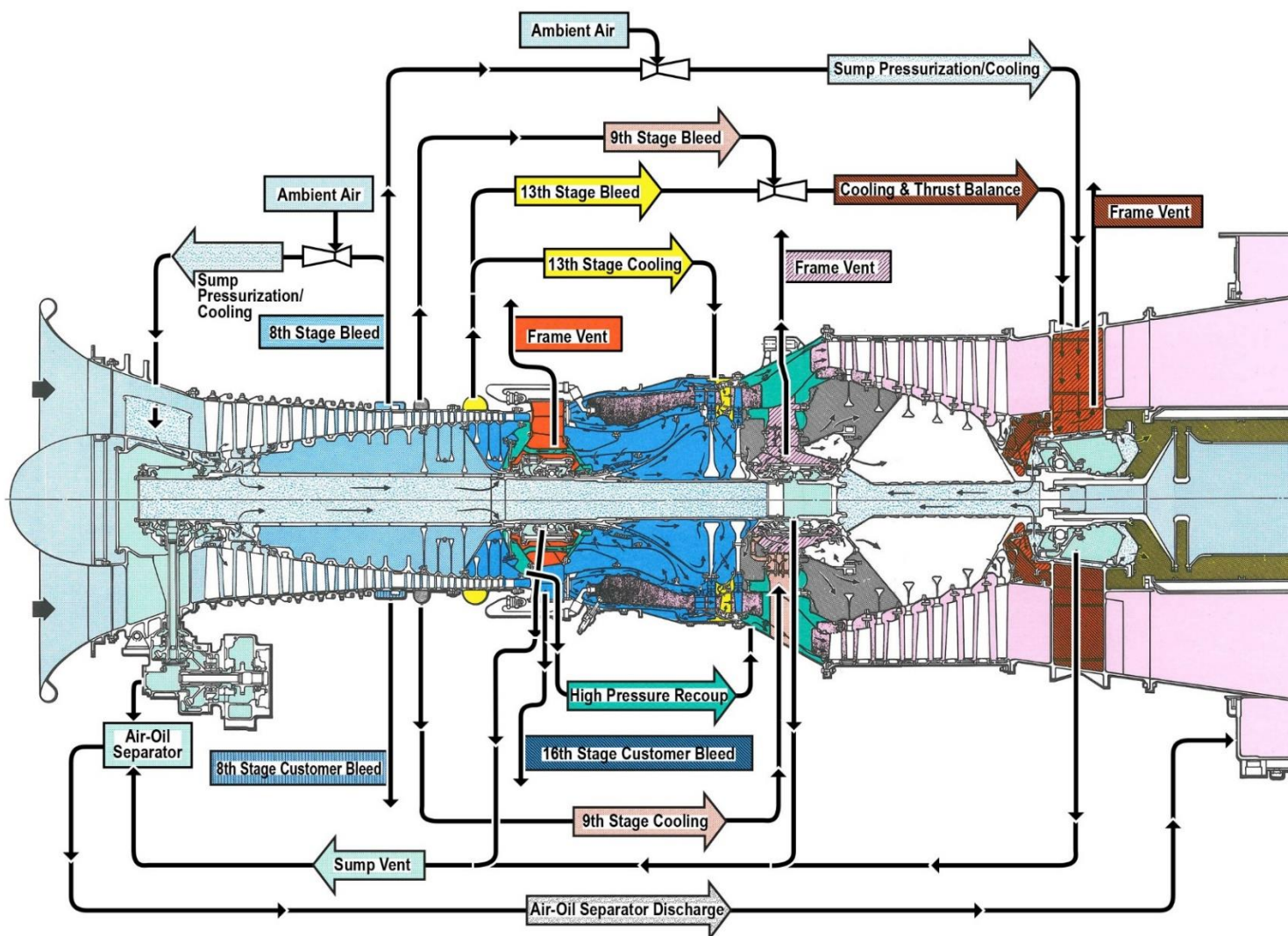
70. For the GE LM2500 gas turbine shown in the illustration, the 9th stage bleed air is used for which of the following? Illustration GT-0017

- A. High-pressure turbine second stage nozzle cooling
- B. Power turbine cooling
- C. Sump pressurization and cooling
- D. Compressor balance piston cavity pressurization

Correct answer: B



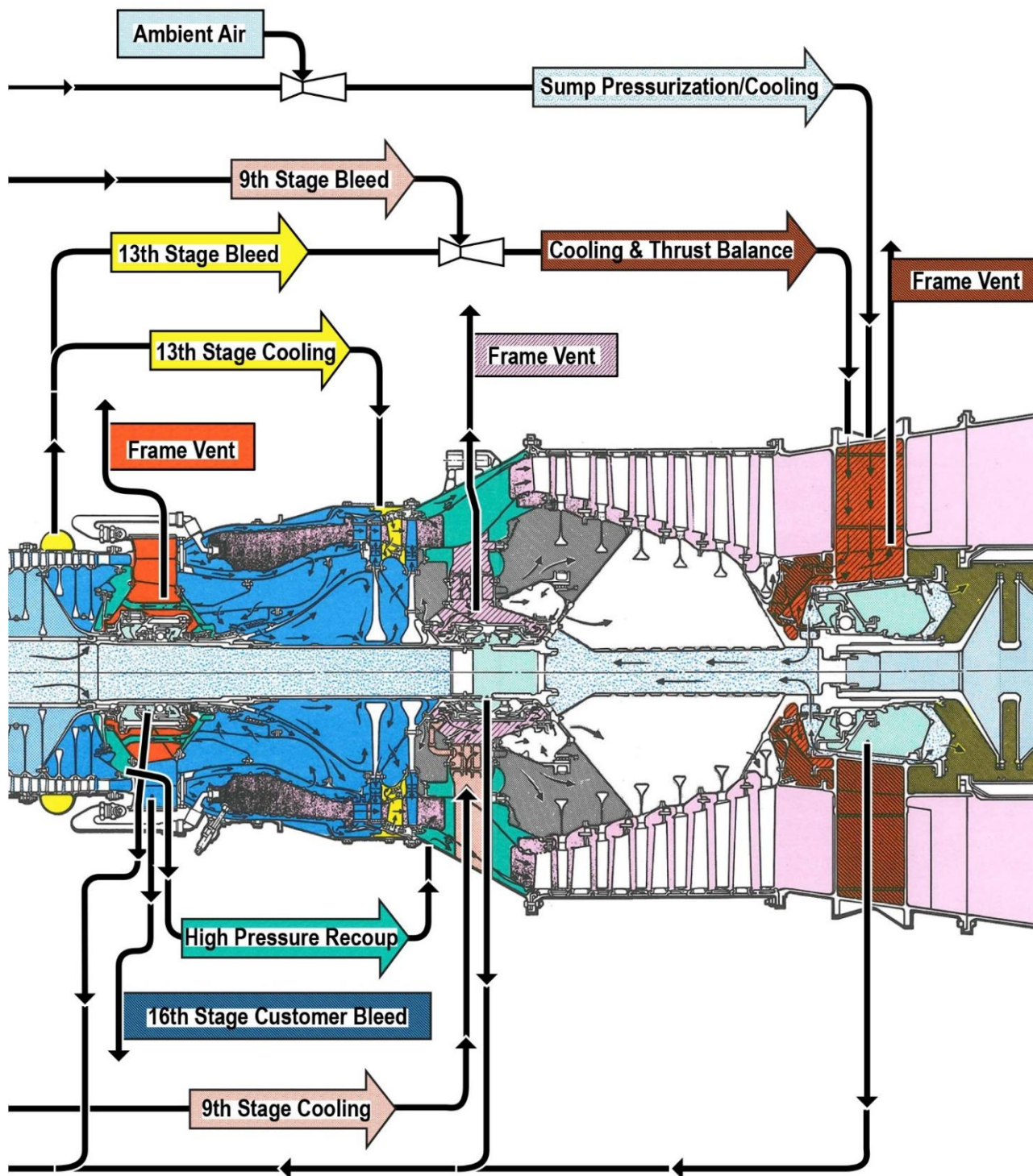
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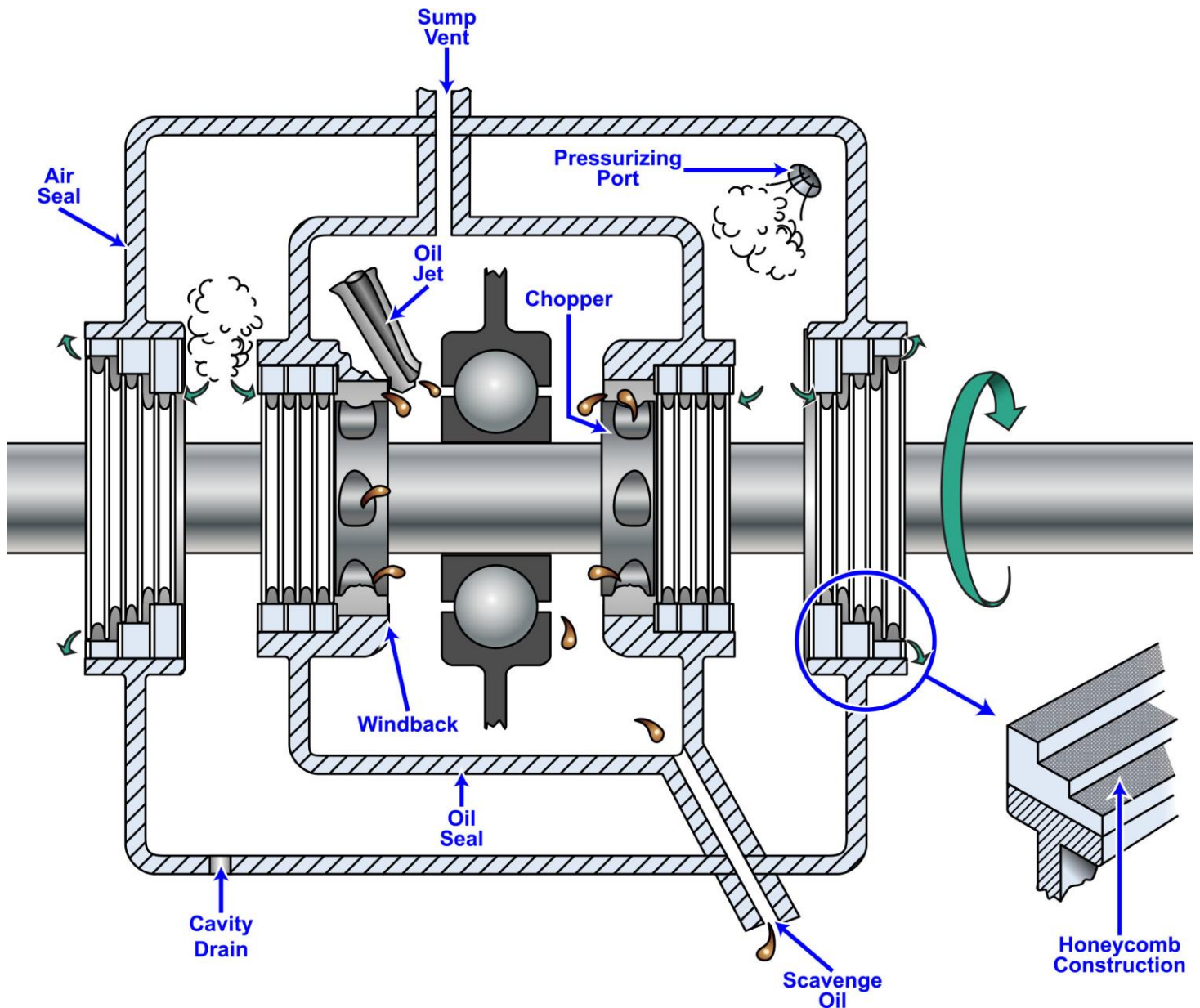
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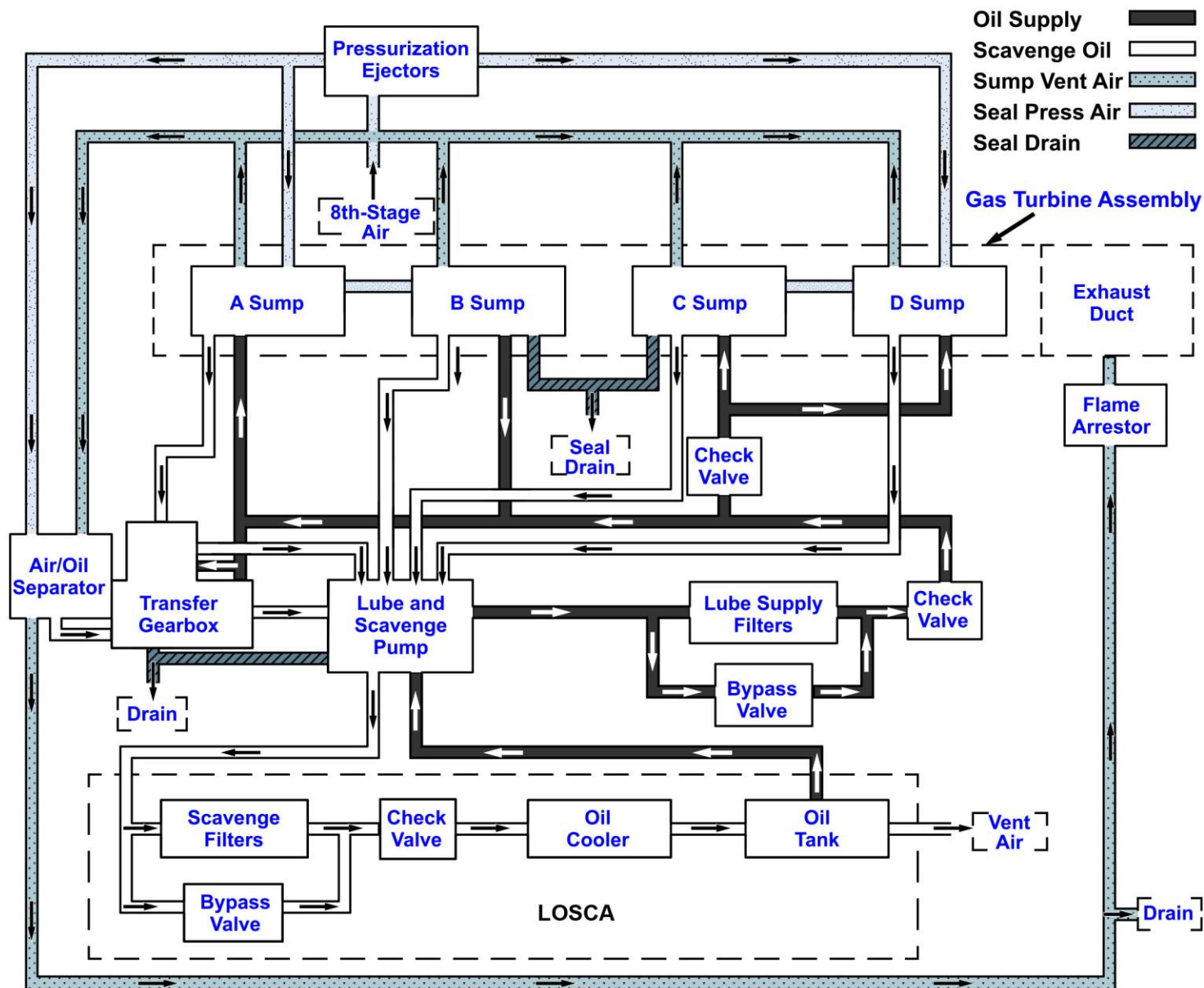
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