U.S.C.G. Merchant Marine Exam

Assistant Engineer – Limited

Q612 Gas Turbine Plants

(Sample Examination)

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

1. The gas generating sections of marine gas turbine engines are based on which of the following?

   A. Free piston engines
   B. Aircraft jet engines
   C. Oil-fired auxiliary boilers
   D. Radial piston engines

   Correct answer: B

2. 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

3. The Brayton Cycle is a series of events best described by which of the following statements?

   A. Intake, decompression, combustion, expansion, exhaust
   B. Intake, pressurization, ignition, exhaust
   C. Intake, compression, combustion, expansion, exhaust
   D. Intake, compression, combustion, explosion, exhaust

   Correct answer: C

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

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

   Correct answer: C

5. The acronym GG represents which of the following?

   A. Temperature-gas generator
   B. Vibration-gas generator
   C. Gas generator
   D. Speed-gas generator

   Correct answer: C

6. The acronym MFC represents which of the following?

   A. Main fuel control
   B. Midframe compressor
   C. Manifold fuel control
   D. Maritime fuel congress

   Correct answer: A

7. Power is defined as which of the following?

   A. Work performed through a distance
   B. The rate of applying a force
   C. The rate of doing work
   D. Force applied through a distance

   Correct answer: C

8. Mechanical work is defined as which of the following?

   A. Distance traveled over time
   B. A measurement in pounds per square inch
   C. Rate of doing work
   D. A force acting through a distance

   Correct answer: D

9. Which of the following terms refers to thermal energy in transition?

   A. Heat
   B. Power
   C. Horsepower
   D. Foot-Pound

   Correct answer: A

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

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

    Correct answer: C

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

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

    Correct answer: B

12. Under standard atmospheric conditions, 208.7 PSIG converts to approximately what in absolute pressure?

    A. 214.7 PSIA
    B. 104.7 PSIA
    C. 194.0 PSIA
    D. 223.4 PSIA

    Correct answer: D

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

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

    Correct answer: C

14. What is the disadvantage of a dual-entry centrifugal compressor compared to a single-entry centrifugal compressor?

    A. The dual-entry compressor rotates at slower speeds.
    B. The dual-entry compressor has a greater efficiency.
    C. The dual-entry compressor is larger in diameter.
    D. The dual-entry compressor utilizes a more complicated inlet ducting.

    Correct answer: D

15. An axial compressor stage is represented by which of the following components and in which order?

    A. One set of stationary vanes, one set of rotating blades.
    B. One set of rotating blades, one set of stationary vanes.
    C. One set of rotating vanes, one set of stationary blades.
    D. One set of rotating blades, two sets of stationary vanes.

    Correct answer: B

16. 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

17. Which of the following terms refers to axial compressor stator blades?

    A. Shrouds
    B. Roots
    C. Vanes
    D. Nozzles

    Correct answer: C

18. Variable stator vanes give an axial gas turbine compressor which of the following capabilities?

    A. Ability to maximize turbine surge capacity across all speeds
    B. Ability to maintain constant turbine primary air flow across all speeds
    C. Ability to maintain constant turbine compression ratio across all speed
    D. Ability to maximize turbine efficiency across all speeds

    Correct answer: D

19. What is a compressor midspan shroud?

    A. A method of securing stator blades
    B. A support for the tips of the stator blades
    C. The center of a two-piece rotor blade
    D. A brace built into the middle of a rotor blade for damping

    Correct answer: D

20. The primary function of an axial compressor rotor blade is which of the following?

    A. To use centrifugal force to increase the pressure of the air stream
    B. To change the direction of the air flow
    C. To act as a diffuser to the air flow causing an increase in pressure with a resultant decrease in velocity
    D. To impart acceleration to the air mass, resulting in an increase in velocity

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

    Correct answer: A

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

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

    Correct answer: C

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

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

    Correct answer: A

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

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

    Correct answer: C

25. What are the two principle functions of the turbine nozzle guide vanes?

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

    Correct answer: D

26. The circle of turbine stationary vanes that convert pressure and thermal energy to velocity energy and direct the combustion gases in the direction of turbine wheel rotation is referred to as what?

    A. Diffuser assembly
    B. Rotor assembly
    C. Compressor assembly
    D. Nozzle assembly

    Correct answer: D

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

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

    Correct answer: A

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

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

    Correct answer: B

29. Aboard ship, single-shaft gas turbines are used mostly as prime movers for which of the following applications?

    A. Generators
    B. Auxiliary power units
    C. Single-screw ships
    D. Multi-screw ships

    Correct answer: A

30. 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 remove burrs and dirt from the shaft
    C. To prevent air from entering the sump
    D. To seal against maximum fluid pressure

    Correct answer: A

31. What type of air seal is used in the combustor and turbine midframe of a gas turbine?

    A. Fishmouth
    B. Lip-type
    C. Labyrinth-Honeycomb
    D. Pneumatic carbon ring

    Correct answer: A

32. Accelerating the compressor to the self-sustaining speed of the engine is the function of which of the following components?

    A. PT shaft
    B. Compressor extension shaft
    C. Mechanical drive shaft
    D. Starter

    Correct answer: D

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

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

    Correct answer: D

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

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

    Correct answer: C

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

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

    Correct answer: B

36. The lube oil scavenge pressure on the gas turbine engine shown in the illustration is sensed by which of the following? Illustration GT-0017

    A. RTD
    B. Probe
    C. Manometer
    D. Transducer

    Correct answer: D

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

    Correct answer: A

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

    Correct answer: D

39. Gas turbine fuel manifold pressure is established by which of the following actions?

    A. Starting the fuel service pumps on low-speed
    B. Starting the fuel service pumps on high-speed
    C. Rotating the gas generator
    D. Closing the fuel recirculating valve

    Correct answer: C

40. What is the approximate percentage of air extracted from the compressor that is mixed with fuel for combustion in a gas turbine?

    A. 12%
    B. 25%
    C. 50%
    D. 75%

    Correct answer: B

41. How is the clutch shown in the attached illustration engaged? Illustration GT-0018

    A. Clutch engages automatically when input shaft flange is rotating faster than the output assembly.
    B. Clutch is engaged manually prior to start up.
    C. Clutch engages automatically once the output assembly begins rotating.
    D. Pneumatic pressure from the compressor engages the clutch.

    Correct answer: A

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

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

    Correct answer: B

43. The purpose of the main reduction gear in a marine gas turbine propulsion installation is which of the following?

    A. Transfer high-speed gas turbine rotation to low-speed propeller rotation.
    B. Transfer low-speed gas turbine rotation to high-speed propeller rotation.
    C. Reduce gas turbine speed to engage the clutch.
    D. Increase gas turbine speed to engage the clutch.

    Correct answer: A

44. 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

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

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

    Correct answer: B

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

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

    Correct answer: A

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

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

    Correct answer: C

48. Accelerometers are generally used on gas turbine engines to sense which of the following?

    A. Rate of rotor speed changes
    B. High frequency vibration
    C. PLARA rate limited feedback to the FSEE
    D. Gas generator speed with respect to power turbine speed

    Correct answer: B

49. Wrenches that are recommended for use on gas turbine engines should be plated with which of the following elements?

    A. Silver
    B. Carbon
    C. Bronze
    D. Nickel

    Correct answer: D

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

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

    Correct answer: C

51. All clock positions, engine references, and enclosure references apply to viewing the gas turbine engine shown in the illustration, from which of the following locations? Illustration GT-0017

    A. Right side of the compressor to the left side
    B. Left side of the power turbine to the right side
    C. Rear (exhaust end), looking toward the intake end
    D. Intake end, looking toward the exhaust end

    Correct answer: C

52. Which of the following instruments is designed to help you when performing an internal inspection of the gas turbine engine?

    A. Telescope
    B. Borescope
    C. Stroboscope
    D. Oscilloscope

    Correct answer: B

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

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

    Correct answer: C

54. You are on watch on a gas turbine propelled vessel as shown in the illustration. After reducing power in response to a high lube oil supply temperature alarm, the temperature continues to increase. Your next step should be which of the following? Illustration GT-0017

    A. Shutdown the engine
    B. Check oil consumption
    C. Continue to reduce power
    D. Water wash the engine

    Correct answer: A

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

    Correct answer: D

56. Where are the carbon dioxide nozzles located in the GE LM2500 gas turbine enclosure?

    A. Above the compressor
    B. On the cross beam under the compressor front frame
    C. Above and below the combustor section
    D. On either side of the power turbine

    Correct answer: B

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

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

    Correct answer: B

58. How many shock mounts are used to secure the GE LM2500 gas turbine enclosure to the ship's foundation?

    A. 16
    B. 24
    C. 32
    D. 40

    Correct answer: C

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

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

    Correct answer: C

60. For the GE LM2500 gas turbine engine shown in the illustration, the HP turbine 2nd stage nozzle vanes are cooled by which of the following? Illustration GT-0020

    A. 9th stage compressor air
    B. 13th stage compressor air
    C. 16th stage compressor air
    D. Frame vent bleed air

    Correct answer: B

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

    Correct answer: A

62. Auxiliary boilers are divided into several classifications, one of which is _____.

    A. water-tube supercritical circulation
    B. water-tube forced circulation
    C. fire-tube controlled circulation
    D. fire-tube express circulation

    Correct answer: B

63. Which of the following statements concerning fire-tube boilers is correct?

    A. Combustion gases flow through the tubes.
    B. Flames impinge on the tubes.
    C. Combustion occurs in the tubes.
    D. Water flows through the tubes.

    Correct answer: A

64. Fusible plugs are installed in fire-tube boilers to _____.

    A. provide a means of draining the boiler
    B. warn the engineer of low water level
    C. cool the crown sheet at high firing rates
    D. open the burners' electrical firing circuits

    Correct answer: B

65. A photoelectric cell installed in an automatically fired auxiliary boiler burner management system _____.

    A. opens the burner circuit upon sensing a flame failure
    B. detects a flame failure by monitoring radiant heat from glowing refractory
    C. requires mechanical linkage to secure the burner fuel supply
    D. must be bypassed at low firing rates

    Correct answer: A

66. Which of the following actions takes place in the control circuit of an automatically fired auxiliary boiler when the desired steam pressure is obtained?

    A. A temperature sensing device opens the circuit breaker in the burner motor.
    B. The high limit control secures power to the entire oil firing system.
    C. The stack relay actuates the low limit control which breaks the ignition circuit.
    D. The stack relay secures power to the high voltage side of the ignition transformer.

    Correct answer: B

67. A variable capacity, pressure atomizing, fuel oil burner functions to _____.

    A. maintain a constant fuel temperature
    B. provide a wide range of combustion
    C. provide a constant fuel return pressure
    D. maintain smokeless fuel oil atomization

    Correct answer: B

68. When preparing to light off a cold boiler equipped with a return flow fuel oil system, the recirculating valve directs the flow of oil _____.

    A. directly to the fuel oil heater inlet for further warm-up
    B. back to the fuel oil settler for further filtration
    C. back to the suction side of the service pump
    D. directly to the deep tanks

    Correct answer: C

69. In the boiler steam and water system, pressure is highest in the _____.

    A. feed line
    B. steam stop
    C. dry pipe
    D. mud drum

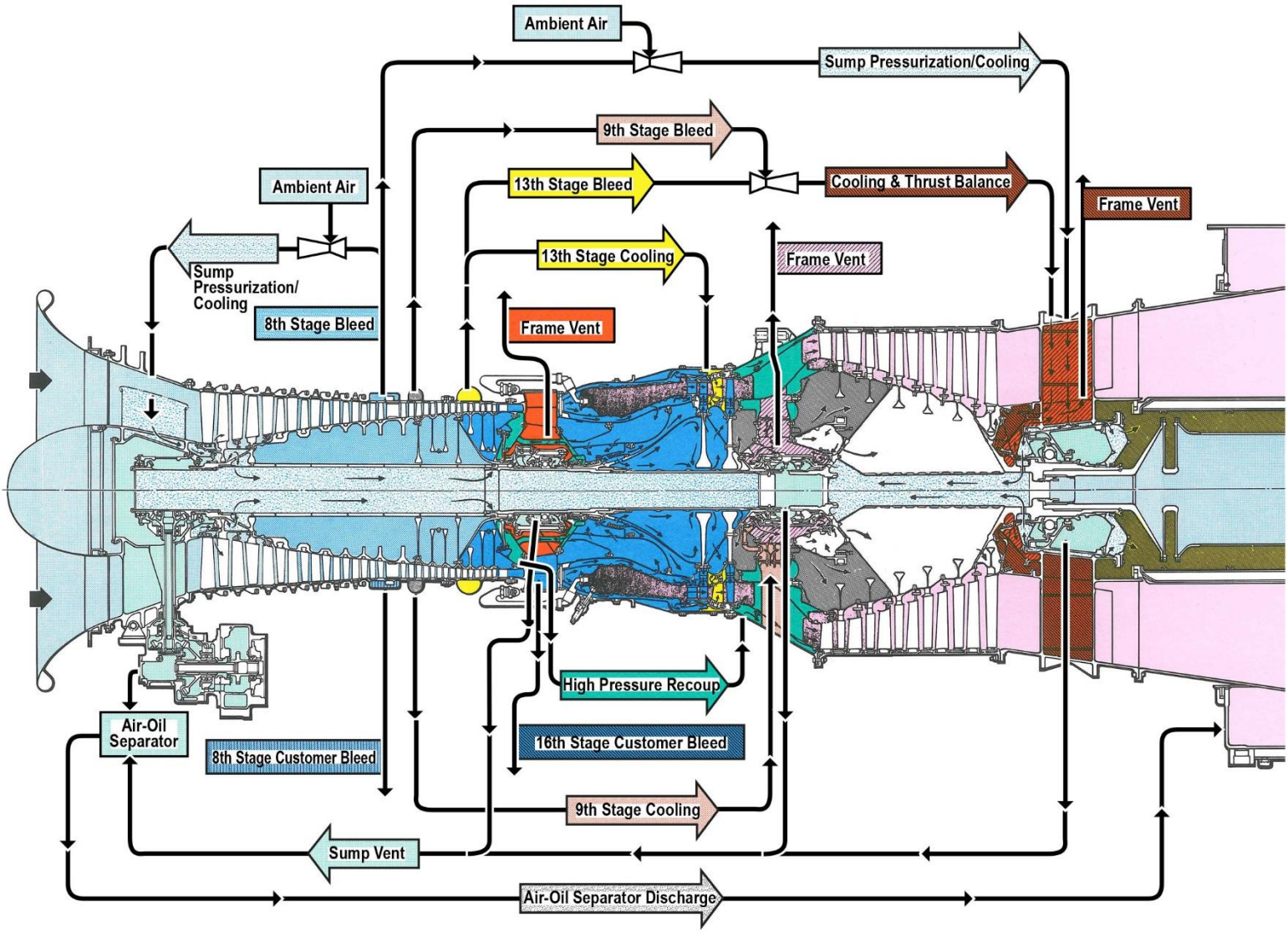
    Correct answer: A

70. A single element boiler feedwater regulating system used aboard ship utilizes _____.

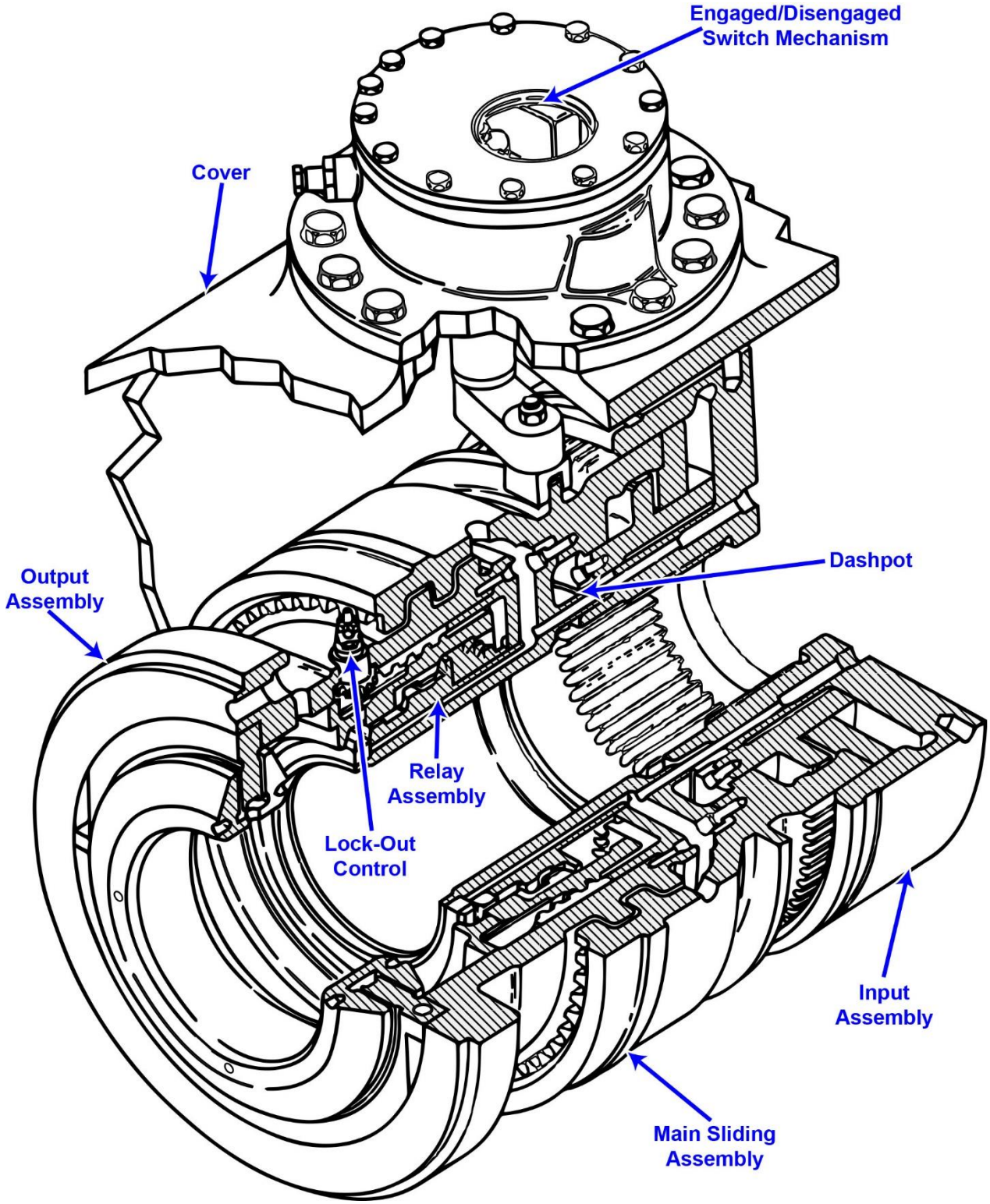
    A. proportional action
    B. proportional plus reset action
    C. two-position differential gap action
    D. proportional plus reset plus rate action

    Correct answer: A

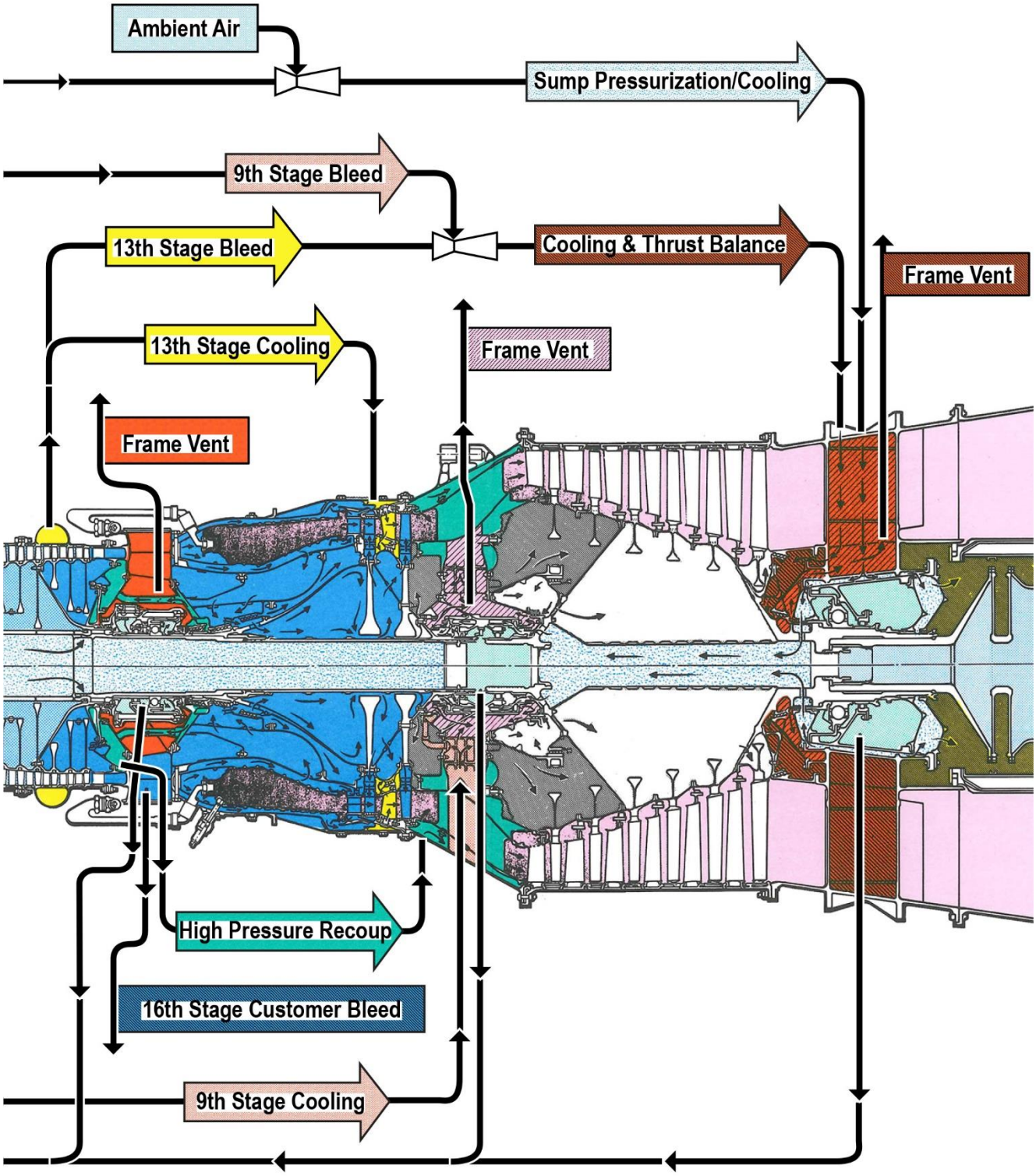
GT-0017



GT-0018



GT-0020



GT-0023