U.S.C.G. Merchant Marine Exam

Third Assistant Engineer

Q538 Steam Plants II

(Sample Examination)

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Illustrations: 4

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

1. Chemicals are added to boiler water to _____.

A. eliminate the need for blowdowns
B. prevent scale forming deposits
C. stabilize feedwater if a boiler becomes salted up
D. maintain an acidic condition in the feedwater

Correct answer: B

2. 8 ounces of oxygen, dissolved in 500,000 pounds of water, is a concentration of _____.

A. 1.0 ppm
B. 4.0 ppm
C. 8.0 ppm
D. 16.0 ppm

Correct answer: A

3. Treatment of boiler feedwater for the control of hardness is necessary to prevent _____.

A. foaming
B. excessive feedwater alkalinity
C. carryover
D. waterside scale deposits

Correct answer: D

4. What boiler water chemistry is necessary to ensure the precipitation of hard scale forming calcium?

A. Hydrazine concentrations should be at the proper level.
B. Boiler water should be slightly acidic.
C. Boiler water should have a reserve of phosphates.
D. Boiler water hardness should be high.

Correct answer: C

5. The major reason dissolved gases are removed from boiler feedwater is because they may cause _____.

A. a false boiler water level
B. corrosive conditions in the boiler
C. vapor lock in the feed pumps
D. condenser vacuum loss

Correct answer: B

6. Carbon dioxide dissolved in boiler water is dangerous in a modern power boiler because the gas _____.

A. combines with oxygen to cause severe waterside scaling
B. combines with sulfates to cause severe waterside pitting
C. forms carbonic acid which attacks the watersides
D. breaks the magnetic iron oxide film inside boiler tubes

Correct answer: C

7. Which of the following represents a significant system limitation to be aware of when a burner management system is operated in the "HAND" mode?

A. The flame failure alarm cannot function when the boiler is "HAND" fired.
B. The burner sequence control is fully automatic even in the "HAND" mode.
C. Some boiler safety interlocks are bypassed when the boiler is "HAND" fired.
D. The burner is not capable of maintaining a high firing rate when the boiler is in the "HAND" mode.

Correct answer: C

8. When the flame scanner senses flame failure during boiler operation, which of the listed events will occur FIRST?

A. The fuel oil solenoid valve is de-energized.
B. The fuel oil service pump is stopped.
C. The automatic purge cycle commences.
D. The "trial for ignition" period commences.

Correct answer: A

9. As found in a basic pneumatic automatic combustion control system, the function of a standardizing relay is to _____.

A. Provide a backup means for manual control of the system
B. Introduce a control for maintaining constant steam pressure regardless of boiler load
C. Introduce a control for maintaining constant superheated steam temperature regardless of boiler load
D. Control the boiler drum water level within acceptable limits regardless of the load

Correct answer: B

10. Modern day boiler automation allows bypassing the "flame safeguard" system to permit a burner to have a "trial for ignition" period during burner light off. This period may not exceed _____.

A. 5 seconds
B. 10 seconds
C. 15 seconds
D. 30 seconds

Correct answer: C

11. Because of the pressure drop existing across each diaphragm, the flow of steam between the nozzle diaphragm and the rotor of the turbine is held to a minimum by _____.

A. a fluid seal
B. a labyrinth packing ring
C. deflector rings
D. a Babbitt liner

Correct answer: B

12. What happens to the steam as it moves across the moving blades in a reaction turbine?

A. It loses velocity at constant pressure.
B. It creates an axial thrust in the direction of the steam flow.
C. It creates an axial thrust opposing the direction of steam flow.
D. It gains velocity at constant pressure.

Correct answer: B

13. Large temperature and pressure drops which occur in the first stage of a combination impulse and reaction turbine are caused by steam passing through _____.

A. a single row of blades more than once
B. one or more velocity-compounded impulse stages at the high-pressure end of the turbine
C. a nozzle diaphragm in the low-pressure end of the turbine
D. a dummy piston and cylinder to offset axial thrust

Correct answer: B

14. Why is superheated steam used in the main propulsion turbines instead of saturated steam?

A. Less specific energy available per pound of steam.
B. Greater heat energy available per pound of steam.
C. Lower required specific volume than saturated steam.
D. Higher pressure available than saturated steam.

Correct answer: B

15. As steam first enters the main propulsion turbine, which of the following energy conversions takes place?

A. chemical to thermal
B. potential to kinetic
C. thermal to chemical
D. mechanical to thermal

Correct answer: B

16. When turbine rotor shafts extend through the casing, an external source of sealing steam is used in conjunction with labyrinth packing to _____.

A. seal the casing during periods of high casing pressure
B. provide a constant flow to the gland leakoff condenser
C. seal the casing during periods of low casing pressure
D. maintain the rotor journal temperature

Correct answer: C

17. The correct radial clearances between the rotor and the casing in a propulsion turbine are maintained by the turbine _____.

A. diaphragms
B. interstage packing
C. thrust bearing
D. journal bearings

Correct answer: D

18. The purpose of the sentinel valve installed on a turbine casing is to _____.

A. warn the engineer of excessive pressure in the low-pressure turbine casing
B. vent excess steam to the main condenser
C. warn the engineer of backflow of steam from the exhaust trunk
D. relieve excess pressure to the turbine extraction points

Correct answer: A

19. Main steam turbine bearings are lined with _____.

A. Babbitt
B. steel
C. cast-iron
D. ferrous oxide

Correct answer: A

20. Which of the following statements is true concerning the turbine shown in the illustration? Illustration SE-0016

A. A steam deflector is provided between the astern element and the ahead stages of the LP turbine.
B. The astern element is of the Curtis type consisting of two three-row stages.
C. The ahead rotor can be classified as a helical flow, Parsons type turbine.
D. The low-pressure turbine is designed with reaction type stages.

Correct answer: A

21. The main propulsion shaft turning gear usually connects to the free end of the high-speed high-pressure pinion because the _____.

A. greatest gear ratio between the turning gear motor output and bull gear can be obtained
B. turning gears are double reduction worm type and cannot mate with the low-pressure high-speed pinion
C. arrangement allows for the use of a muff type coupling for flexibility and smooth engagement
D. lubricating oil from the high-speed pinion can easily supply the turning gears

Correct answer: A

22. In securing the main turbines, steam to the second stage air ejectors should be left on for a short period of time in order to _____.

A. dry out the main turbines
B. remove the excessive amount of non-condensable vapors which accumulated during maneuvering operations
C. ensure equal cooling of the main turbine bearings
D. prevent excessive condensate depression

Correct answer: A

23. Operating a steam turbine propulsion unit at medium-speed, in an area with extremely cold sea water and the main circulating pump providing full cooling water flow to the condenser will result in _____.

A. Increased effectiveness of the air ejectors due to the increased main condenser vacuum
B. Increased condensate aeration due to the inability of the air ejectors to remove excessive air accumulation from the condenser
C. Increased plant efficiency due to increased condensate depression
D. Excellent plant efficiency due to higher attainable vacuum

Correct answer: B

24. The FIRST step in breaking vacuum on a main turbine unit should be to _____.

A. secure the steam to the gland seal system
B. secure the steam to the main air ejector
C. stop the main condensate pump
D. stop the main circulating pump

Correct answer: B

25. To stop the rotor of a main turbine while underway at sea you should _____.

A. apply the Prony brake
B. admit astern steam to the turbine after securing the ahead steam
C. tighten the stern tube packing gland
D. secure all steam to the turbine

Correct answer: B

26. The most critical period of main turbine operation is during cold start-up, rather than hot shutdown because _____.

A. lubricant film thickness during start-up is considerably less than the dimensions of gear surface irregularities
B. harmonic vibrations associated with critical speed can easily be reached during start-up
C. the danger of blade erosion damage from dry steam impingement is greater during start-up
D. differential expansion can result from the temperature difference between the rotor and rotor casing

Correct answer: D

27. The original bridge gauge reading for a reduction gear bearing was measured as 0.008 inches. A year later, the bridge gauge reading for the same bearing is 0.010 inches. This indicates _____.

A. bearing wear is 0.002 inch
B. oil clearance has increased 0.010 inch
C. oil clearance is 0.002 inch
D. bearing wear is 0.010 inch

Correct answer: A

28. Which of the following statements describes how the main propulsion turbine overspeed relay initiates closing of the throttle valve?

A. Excessive centrifugal force causes a spring-loaded weight to trip a valve latch.
B. Excessive centrifugal force causes spring loaded flyballs to actuate a control lever.
C. Excessive speed causes an oil pump to develop sufficient pressure to open a spring-loaded relay valve which tends to close the steam control valve.
D. Excessive speed causes an increase in lube oil control temperature which actuates a solenoid oil dump valve.

Correct answer: C

29. Which type of packing is primarily utilized to control steam leakage from the casing of a modern auxiliary turbine?

A. Teflon
B. Dovetail
C. Carbon
D. Labyrinth

Correct answer: D

30. Packing rings installed on auxiliary turbines are generally lubricated by _____.

A. a water leakoff line
B. moisture in the turbine steam
C. separate lube oil lines
D. a saltwater service line

Correct answer: B

31. How is an auxiliary turbine boiler feed pump normally stopped?

A. By actuating the throttle hand tripping device
B. By rotating the hand lube oil pump backwards
C. By closing the exhaust valve slightly
D. By increasing the load on the driven unit

Correct answer: A

32. In the illustration of a typical ship service turbo-generator control system, the handle labeled "B" is used to _____. Illustration SE-0009

A. Bypass the governor control
B. Roll over the high-speed pinion
C. Pump up the lube oil manifold
D. Reset the overspeed trip

Correct answer: D

33. Which of the following is used to hold the poppet valves closed in a turbo-generators nozzle control speed regulator?

A. Springs
B. Oil pressure
C. Lifting beam
D. Steam pressure

Correct answer: D

34. According to the illustration, what is the normal function of the component shown? Illustration SE-0010

A. indicate the pressure and temperature of lube oil leaving a turbine bearing
B. indicate the pressure and flow of lube oil entering a turbine bearing
C. act as a final filter for oil entering a bearing
D. indicate the temperature and flow of lube oil leaving a turbine bearing

Correct answer: D

35. As lube oil absorbs moisture its dielectric strength can be expected to _____.

A. increase with a decrease in viscosity
B. remain the same
C. decrease
D. increase with an increase in viscosity

Correct answer: C

36. If contaminated lube oil were allowed to settle undisturbed in a tank, into which layers would the contaminants separate?

A. Sediment on the bottom, water in the middle, and oil on top.
B. Water on the bottom, oil in the middle, and sediment on top.
C. Water on the bottom, sediment in the middle, and oil on top.
D. Sediment on the bottom, oil in the middle, and water on top.

Correct answer: A

37. Magnets are installed in the main propulsion turbine lube oil strainers to attract metal particles released through wearing of the _____.

A. Babbitt bearings
B. turbine labyrinth
C. reduction gears
D. turbine blades

Correct answer: C

38. Which of the filters listed will deplete the additives in lubricating oil?

A. Extended area membrane filter
B. Cloth bag extractor
C. Absorbent filter
D. Adsorbent filter

Correct answer: D

39. Turbine lube oil suction strainer baskets have _____.

A. self-cleaning design
B. fine perforations
C. frame lined with wire cloth
D. coarse perforations

Correct answer: D

40. Which of the following statements concerning the operation of a lube oil purifier is correct?

A. They should be operated as slowly as possible to ensure a long service life.
B. They should not be primed with water when operated as a separator.
C. They should be operated as clarifiers for optimum moisture removal.
D. They should be operated at maximum design speed and recommended operating capacity.

Correct answer: D

41. In order to obtain the best performance with a lube oil purifier, the lube oil inlet temperature should _____.

A. never exceed the highest main engine bearing temperature
B. be equal to the normal lube oil cooler outlet temperature
C. be maintained in a temperature range of 160°F to a maximum of 180°F
D. be equal to main lube oil sump temperature

Correct answer: C

42. The disk stack and tubular shaft used in a lube oil centrifugal purifier, is forced to rotate at bowl speed by _____.

A. wire springs
B. the drive pin
C. the locating pin
D. the use of an acme thread screw

Correct answer: C

43. The rotating speed of the tubular bowl centrifuge is more than twice that of the disk-type. The reason for this is _____.

A. the drag bushing is used to permit the higher speed of rotation
B. to produce a nearly equal magnitude of centrifugal force
C. a narrow diameter bowl is not affected as much by windage losses as a larger diameter bowl
D. the friction affecting rotation is not as significant with a narrow diameter bowl

Correct answer: B

44. In a steam turbine and reduction gear main propulsion plant, the alarm sensor for low turbine oil pressure is usually installed _____.

A. at a point on the inlet side of the main bearings as close to the bearings as possible
B. at the end of the supply line header to the bearings
C. at the outlet of the main thrust bearing
D. at a point on the outlet side of the main bearings as close to the bearings as possible

Correct answer: B

45. On a ship equipped with a gravity type lube oil system, which of the conditions listed will occur FIRST if the main lube oil pump discharge pressure is lost?

A. Lube oil will be provided to the bearings and gears via the gravity tank overflow line.
B. The astern throttle will immediately open.
C. An alarm will sound.
D. All bearing oil pressure will be lost.

Correct answer: C

46. Water retained in the lube oil system of a main propulsion turbine installation is undesirable because it _____.

A. results in excessive cooling of bearing surfaces
B. causes the turbine to overspeed
C. causes pitting of the gear teeth
D. raises the flash point of the oil to a dangerously high level

Correct answer: C

47. A cloudy or milky appearing lube oil sample, taken from the main lubricating oil system could be caused by _____.

A. insufficient gland sealing steam
B. excessive cooling water to the lube oil cooler
C. insufficient cooling water to the lube oil cooler
D. excessive gland sealing steam

Correct answer: D

48. Most main propulsion reduction gear bearings are _____.

A. self-aligning, solid bushings
B. rigidly mounted, Babbitt lined, split type
C. self-lubricating, sealed, roller ball type
D. spherical-seated, tapered roller type

Correct answer: B

49. Which of the following methods is used to securely fasten the Babbitt lining of a reduction gear bearing to its shell?

A. The Babbitt has a crescent shaped pocket cast symmetrically about the bearing split.
B. The Babbitt is securely bonded to the shell by the pressure of the hydrodynamic oil wedge.
C. The Babbitt is relieved in way of the split and held in place by locking pins.
D. The Babbitt is centrifugally spun into the bearings or cast under a pressure head.

Correct answer: D

50. Axial movement in a gear-type flexible coupling is provided for by _____.

A. gear teeth on the floating member sliding between internal teeth on the shaft ring
B. each gear sliding on its shaft between retaining collars
C. the variable oil clearance in the quill shaft
D. adjusting the pitch of the teeth on the pinion and high-speed gears

Correct answer: A

51. Reduction gears for main propulsion turbines are lubricated by _____.

A. leakoff lines from the lube oil cooler
B. oil flinger rings mounted on the shaft
C. grease cups and gravity feed lines
D. spray nozzles at the gear meshing points

Correct answer: D

52. After the housing has been bolted down, the final check of reduction gear tooth contact is usually made by _____.

A. bluing the teeth
B. bridge gauges
C. dial indicators
D. alignment gauges

Correct answer: A

53. A Kingsbury, or pivot shoe type thrust bearing, can bear much greater loads per square inch of working surface than can parallel surface bearings because provisions are made in the Kingsbury bearing _____.

A. to allow the leveling plates to pivot on the collar when thrust loads are applied
B. for the shoes to tilt slightly, thereby allowing the formation of a wedge-shaped oil film under a thrust load
C. for adjusting the filler piece thickness behind the pivotal-shoes to give a more accurate fit
D. for automatically adjusting clearances to the correct value when wear occurs

Correct answer: B

54. Which of the following operational practices is helpful in avoiding the accumulation of condensate in the main reduction gear casing?

A. After the main unit is secured, lubricating oil should be circulated until the temperature of the oil and reduction gear casing approximates the engine room temperature.
B. The temperature of the lubricating oil should not exceed the gear manufacturer's recommendation when the unit is operating at full load.
C. Avoid applying gland sealing steam to the low-pressure turbine until you are ready to start up the first-stage air ejector.
D. Always ensure that the lubricating oil pressure is 14-17 psi when operating in unusually cold waters.

Correct answer: A

55. The slight wavy appearance of the tips of reduction gear teeth is a result of _____.

A. the method of manufacture and does affect normal operation
B. high lube oil temperatures
C. insufficient lube oil pressure
D. uneven bearing wear due to gross misalignment

Correct answer: A

56. Auxiliary steam at full operating pressure is supplied from the boiler directly to the _____.

A. turbogenerators
B. main air ejectors
C. distilling plants
D. sootblowers

Correct answer: D

57. Which of the following conditions is indicated by the necessity of providing excessive gland sealing steam pressure to maintain the normal operating conditions of the main propulsion unit?

A. Vacuum leak in the condenser shell.
B. Restriction in the gland leakoff piping.
C. Worn or damaged labyrinth packing.
D. Flooded main condenser hotwell.

Correct answer: C

58. A contaminated steam generator is used to produce saturated vapor from collected _____.

A. bilge water
B. fuel oil heating return drains
C. condenser cooling water
D. sanitary water

Correct answer: B

59. The intermediate pressure bleed steam system, shown in the illustration, is used to supply steam at approximately _____. Illustration SG-0024

A. 13.6 psia
B. 13.6 psig
C. 35.0 psig
D. 67.0 psig

Correct answer: D

60. If a major flareback occurs to a boiler, which of the following actions should be immediately taken?

A. Secure the forced draft fan
B. Secure the fuel to the burners
C. Purge the fuel oil system
D. Secure all fireroom ventilation

Correct answer: B

61. Which boiler casualty is considered to be the most serious?

A. Low water level
B. High water level
C. Low feed pressure
D. Loss of feed suction

Correct answer: A

62. If it should become necessary to abandon a compartment because of the danger of a large steam leak on a boiler, which of the following actions represents the best avenue of escape?

A. Use fireroom elevator to an upper deck.
B. Escape through another compartment on a lower level.
C. Escape by way of a fireroom ladder to the outer deck.
D. Escape through another compartment on a higher level.

Correct answer: B

63. Which of the precautions listed should be taken when gagging a boiler safety valve?

A. Do not allow the gag to contact the safety valve stem.
B. Tighten the gag only with the special wrench supplied with the gag.
C. Ensure that all moving parts of the safety valve are free to move before installing the gag.
D. Tighten the gag only finger tight to prevent damage to the valve stem, disc or seat.

Correct answer: D

64. When the plunger of an injection pump of an auxiliary diesel engine is stuck, it may cause which of the following conditions?

A. injector failure
B. engine shutdown
C. failure of the cylinder to fire
D. excessive fuel consumption

Correct answer: C

65. What is the purpose of a rotocap on an auxiliary diesel engine exhaust valve spindle?

A. to keep the valve cool
B. to increase lube oil penetration to the guide
C. to increase valve life
D. to close the valve

Correct answer: C

66. At what piston position should you set the valve clearance on a four-stroke auxiliary diesel engine?

A. TDC on the compression stroke
B. TDC on the exhaust stroke
C. BDC on the intake stroke
D. BDC on the power stroke

Correct answer: A

67. When removing a piston, what is a good indication that your lube oil is good and supplied in the proper amount?

A. liners and piston rings have a bright surface and rings are free
B. liners and piston rings have a dull grayish appearance and rings are free
C. liners and piston rings have a dull grayish appearance and rings are tight
D. liners and piston rings show an accumulation of lube oil deposits and rings are tight

Correct answer: A

68. When you hear an exhaust gas turbine of an auxiliary diesel engine surge it sounds like it is "barking." What is the likely cause of a turbine "barking?"

A. damaged blades
B. a dirty intake air filter
C. insufficient lube oil supply
D. worn bearings

Correct answer: B

69. What color smoke may be indicative of a leaking head gasket?

A. blue smoke
B. black smoke
C. gray smoke
D. white smoke

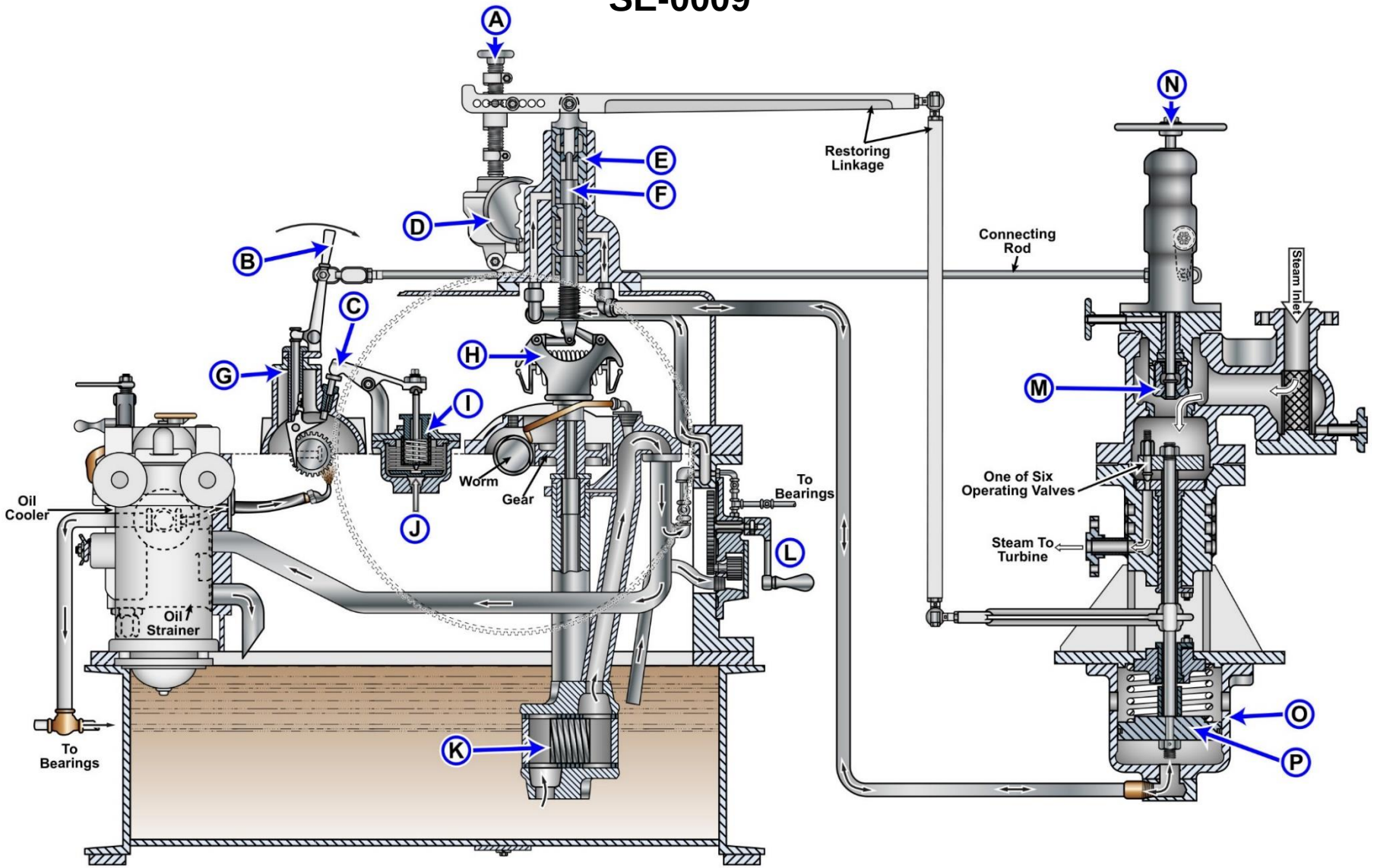
Correct answer: D

70. If an auxiliary diesel engine is overheating at a steady load, what should be the first thing that you suspect?

A. air intake blocked
B. low lube oil pressure
C. excessive fuel
D. loss of cooling water flow

Correct answer: D

SE-0009



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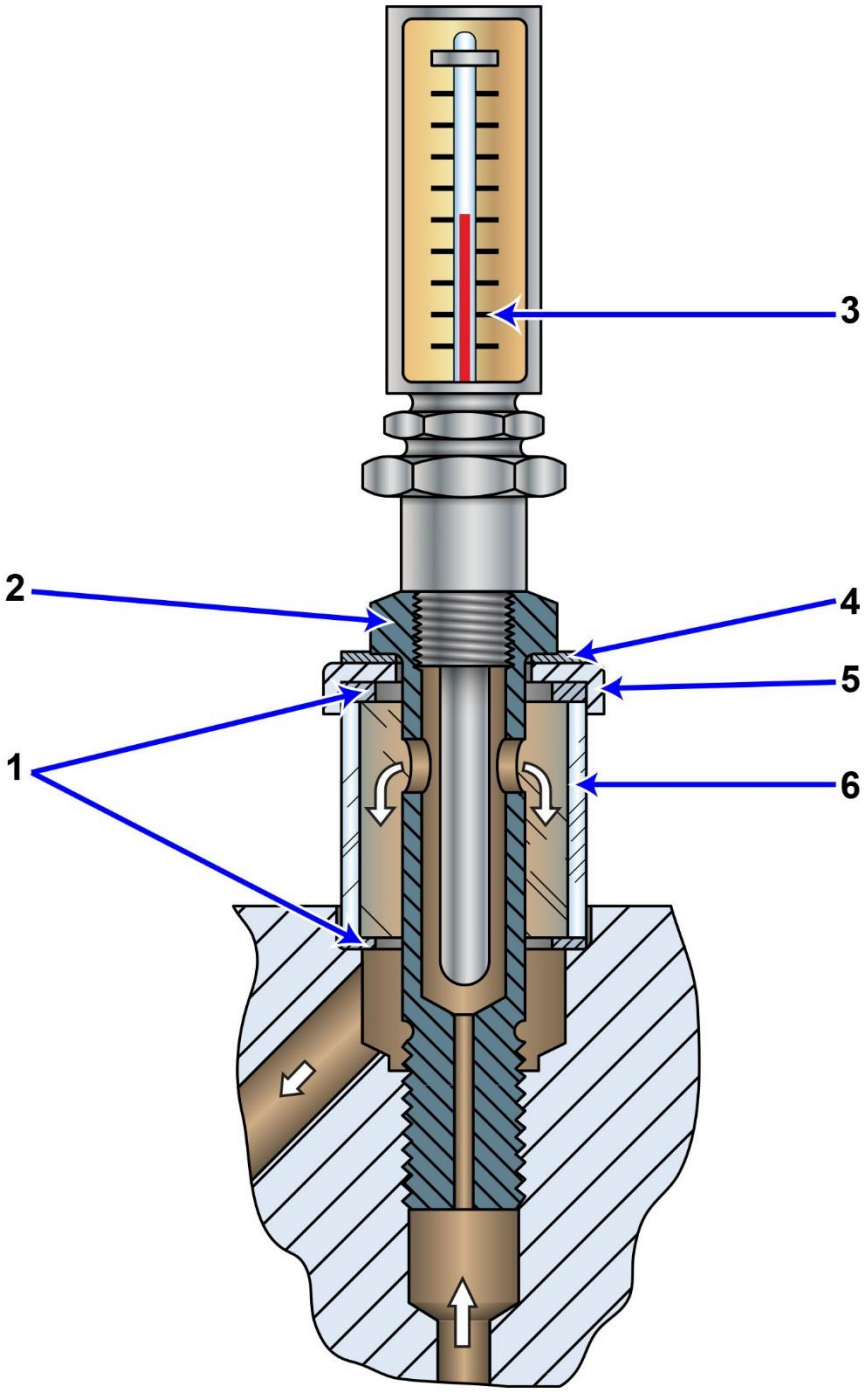

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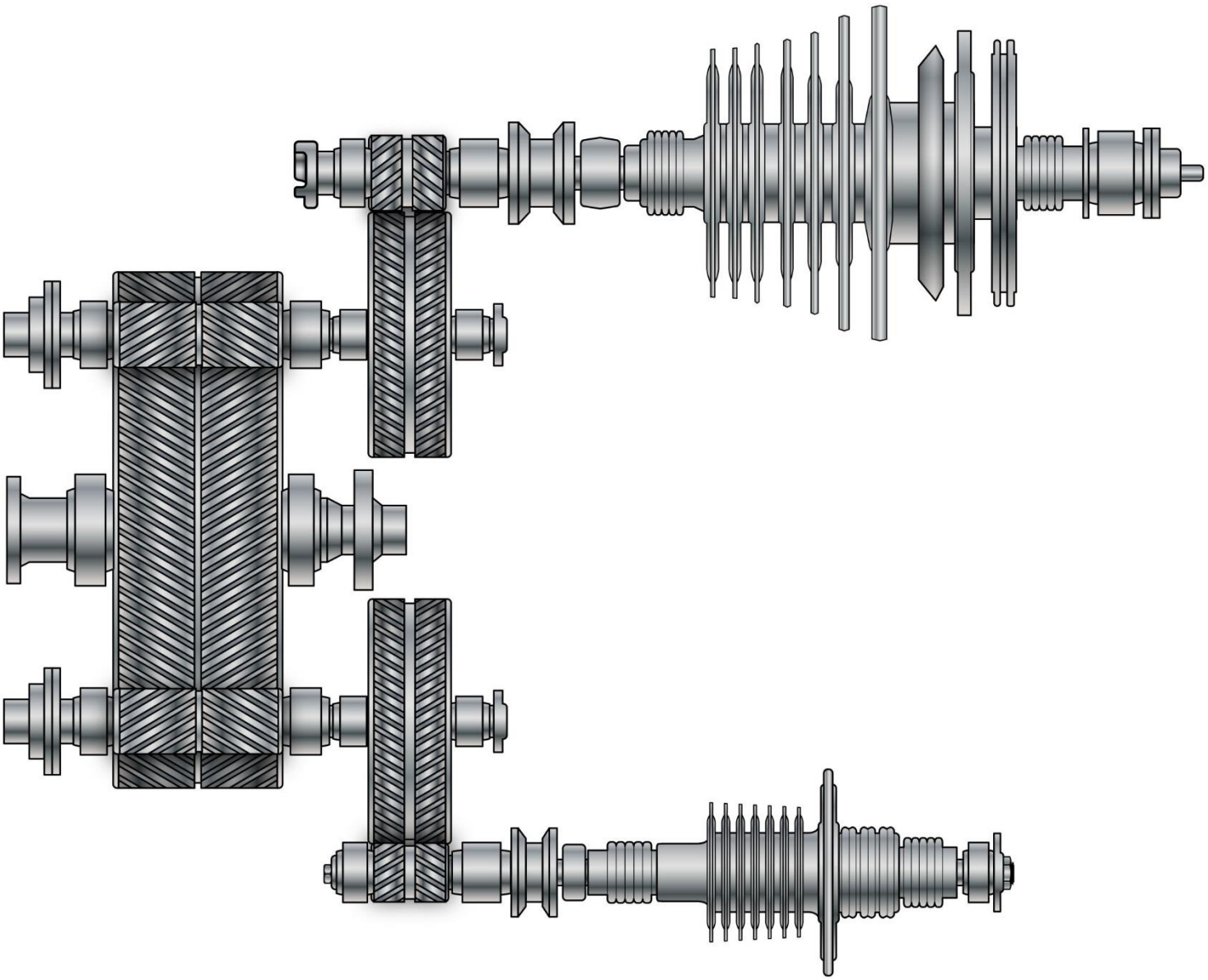

SG-0024

Nominal System Pressures

Gauge	psig
A	35 (in port) 67 (max. load underway)
B	35
C	35
D	33
E	67
F	13.6 psia
G	5
H	8 psia

Device Settings

Valve	Psig
1	150°F
2	35
3	34-38
4	33
5	5