U.S.C.G. Merchant Marine Exam

Third Assistant Engineer

Q532 Motor Plants II

(Sample Examination)
Choose the best answer to the following Multiple Choice Questions:

1. An increase in the air inlet manifold pressure of a diesel engine will result in a/an __________.
   - (A) decrease in maximum cylinder pressure
   - (B) increase in ignition lag
   - (C) decrease in fuel consumption per horsepower-hour
   - (D) decrease in exhaust manifold pressure

   If choice C is selected set score to 1.

2. The vessel to which you are assigned has main engines fitted with intake and exhaust systems as shown in the illustration. Assume that the vacuum between the air filter and the turbocharger blower inlet is 12” of water column (negative with respect to atmospheric pressure) when the engine is running at 50% of maximum, continuous rated load. What will happen to the suction vacuum when the load is increased to 100% of maximum continuous rated load? Illustration MO-0076
   - (A) The depth of vacuum will increase (reading more inches of water column negative with respect to atmospheric pressure).
   - (B) No change in the depth of vacuum will occur (reading the same inches of water column negative with respect to atmospheric pressure).
   - (C) The depth of vacuum will decrease (reading less inches of water column negative with respect to atmospheric pressure).
   - (D) A loss of vacuum will occur (now reading inches of water column positive with respect to atmospheric pressure).

   If choice A is selected set score to 1.

3. In a naturally aspirated diesel engine, the volumetric efficiency of the intake air charge is mainly influenced by the __________.
   - (A) cylinder mean effective pressure
   - (B) valve size
   - (C) fuel injection pressure
   - (D) compression ratio

   If choice B is selected set score to 1.

4. In a diesel engine exhaust system, the cooling of the exhaust gases below their dew point, will result in __________.
   - (A) increased engine back pressure
   - (B) sulfuric acid corrosion
   - (C) surface pitting of the turbocharger compressor blades
   - (D) moisture impingement on the turbocharger compressor blading

   If choice B is selected set score to 1.
5. The instrument shown in the illustration would be used on a diesel engine to __________.
   Illustration MO-0031
   - (A) balance exhaust gas temperature readings
   - (B) measure concentration of chromate in jacket water
   - (C) measure cylinder compression or firing pressures
   - (D) measure exhaust gas pressure

   *If choice C is selected set score to 1.*

6. The exhaust system for a turbocharged diesel engine functions to __________.
   - (A) power the aftercoolers
   - (B) power the turbocharger
   - (C) reduce the cylinder scavenge effect
   - (D) cool the turbocharger

   *If choice B is selected set score to 1.*

7. The vessel to which you are assigned has diesel generators fitted with intake and exhaust systems as shown in the illustration. What statement is true concerning the valves (items #1 and #9)?
   Illustration MO-0176
   - (A) Both items #1 and #9 are intake valves.
   - (B) Item #1 is an exhaust valve and item #9 is an intake valve.
   - (C) Item #1 is an intake valve and item #9 is an exhaust valve.
   - (D) Both items #1 and #9 are exhaust valves.

   *If choice C is selected set score to 1.*

8. A water jacket is placed around the exhaust manifolds of propulsion diesel engines to __________.
   - (A) reduce heat radiation to the engine room
   - (B) aid in preventing turbocharger overheating
   - (C) condense and drain moisture from exhaust gases
   - (D) dampen exhaust gas pulsations in the manifold

   *If choice A is selected set score to 1.*

9. Fuel injectors used in heavy fuel oil systems are usually provided with cooling to reduce __________.
   - (A) cold corrosion of the nozzles
   - (B) fuel viscosity for better atomization
   - (C) carbon accumulation on the nozzles
   - (D) fuel detonation in the cylinders

   *If choice C is selected set score to 1.*
10. Diesel engine closed, re-circulating cooling water systems are particularly prone to cavitation corrosion/erosion. Which of the listed cooling system/engine components has surfaces in contact with the coolant that are most susceptible to this type of corrosion and erosion?

- (A) Cylinder head cooling water passages.
- (B) Engine exhaust cooling water jackets.
- (C) Cylinder cooling water jackets.
- (D) Wet-type cylinder liners.

*If choice D is selected set score to 1.*

11. In a diesel engine jacket water cooler, with sea water cooling the fresh water, the ________.

- (A) jacket water temperature must always be less than 60°F
- (B) sea water temperature must never be warmer than 40°F
- (C) jacket water pressure must always be less than the sea water pressure
- (D) jacket water pressure should always be greater than the sea water pressure

*If choice D is selected set score to 1.*

12. What is the function of the item "7" shown in the illustration? Illustration MO-0111

- (A) This jacket water pump circulates salt water through the jacket water cooling system to provide engine cooling.
- (B) This circulating salt water pump will supply feedwater for the operation of the distiller.
- (C) This jacket water pump supplies the distiller with sea water feed while also powering the eductors.
- (D) This jacket water pump circulates fresh water throughout the engine cooling and distiller heating systems.

*If choice D is selected set score to 1.*

13. The operation of the lube oil cooler, shown in the illustration as item No.4, will be characterized by which of the following statements? Illustration MO-0111

- (A) The temperature of the sea water entering the cooler will be higher when operating with the distiller on line.
- (B) The temperature of the lube oil entering the cooler will decrease whenever the distiller is on line.
- (C) The pressure of the lube oil to the cooler will increase whenever the distiller is on line.
- (D) The pressure of the sea water to the lube oil cooler will increase with the distiller on line.

*If choice A is selected set score to 1.*
14. Which operating parameter may need to be decreased when running a large main propulsion diesel engine at low load conditions?

- (A) Control air supply pressure
- (B) Cooling water flow through aftercoolers
- (C) Lube oil temperature
- (D) Fuel injection pressure

*If choice B is selected set score to 1.*

15. Sacrificial zinc anodes are used on the salt water side of diesel engine heat exchangers to ________.

- (A) reduce electrolytic action on heat exchanger metals
- (B) prevent rapid accumulation of marine growth
- (C) provide a protective coating on heat exchanger surfaces
- (D) keep heat transfer surfaces shiny and clean

*If choice A is selected set score to 1.*

16. Antifreeze solutions containing ethylene glycol should not be mixed with corrosion protection oils, as the resultant mixture ________.

- (A) has a higher chloride content
- (B) may cause frothing
- (C) promotes scale buildup
- (D) is dangerously flammable

*If choice B is selected set score to 1.*

17. Some diesel engines are fitted with a thermometer in the cooling water outlet from each cylinder. If the cooling water temperature from all cylinders begins to rise above normal, you should suspect ________.

- (A) increased blow-by in all cylinders
- (B) insufficient fuel delivery to all cylinders
- (C) incomplete combustion in all cylinders
- (D) overloading in all cylinders

*If choice D is selected set score to 1.*

18. If the jacket water temperature rises rapidly above normal in a diesel engine, you should FIRST ________.

- (A) clean sea water strainer
- (B) reduce engine load
- (C) call the chief engineer
- (D) check thermostatic valve

*If choice B is selected set score to 1.*
19. The average exhaust temperature of a two-stroke cycle diesel engine with a turbine-driven supercharger is lower than a similar four-stroke cycle diesel engine at equal loads because __________.
   o (A) two-stroke cycle diesel engines have a higher M.E.P. than four-stroke cycle diesel engines
   o (B) four-stroke cycle diesel engine exhaust is cooled by scavenging air
   o (C) two-stroke cycle diesel engines have a lower M.E.P. than four-stroke cycle diesel engines
   o (D) the opening of the two-stroke cycle diesel exhaust ports or valves occurs much later than in four-stroke cycle diesel engines

   If choice C is selected set score to 1.

20. The process of scavenging a two-stroke cycle diesel engine serves to __________.

   o (A) improve fuel flow volume
   o (B) cool the exhaust valves
   o (C) reduce the intake air charge density
   o (D) increase the temperature of exhaust gases

   If choice B is selected set score to 1.

21. Which of the following statements is correct regarding a turbocharged four-stroke cycle diesel-generator?

   o (A) At zero load the intake manifold pressure is greater than the exhaust manifold pressure.
   o (B) At full load the intake manifold pressure and exhaust manifold pressure are equal.
   o (C) At full load the intake manifold pressure is less than the exhaust manifold pressure.
   o (D) At full load the intake manifold pressure is greater than the exhaust manifold pressure.

   If choice D is selected set score to 1.

22. Which of the turbocharging methods listed directs the exhaust gases to the turbine at fairly uniform velocity and pressure?

   o (A) Constant pressure
   o (B) Pulse pressure
   o (C) Constant velocity
   o (D) Axial flow

   If choice A is selected set score to 1.

23. In a two-stroke cycle diesel engine, a Roots-type blower is usually __________.

   o (A) gear driven by the engine
   o (B) driven by an exhaust gas turbine
   o (C) actuated by the intake valves
   o (D) driven by separate motor

   If choice A is selected set score to 1.
24. A loop-scavenged engine utilizes the motion of its pistons and a turbocharger to provide scavenging air. Which of the listed mechanical designs prevents the air under the pistons from being pumped back through the scavenge ports during the piston power stroke?

- (A) Masked intake ports.
- (B) Lower liner seals.
- (C) Positive pressure from the blower.
- (D) Length of the piston skirt.

If choice D is selected set score to 1.

25. Why will a turbocharged diesel engine produce black smoke if excessive additional load is applied too quickly?

- (A) Exhaust energy would draw excess air.
- (B) The inertia of the turbocharger rotor causes a time lag which delays the turbocharger speed increase.
- (C) Exhaust gas pumping losses are increased due to turbine windage.
- (D) Exhaust gas back pressure falls slightly due to increased nozzle action.

If choice B is selected set score to 1.

26. What effect does nitrogen, as a volumetric component of a diesel engine's cylinder air charge, have on the ignition and combustion?

- (A) Nitrogen has no effect on ignition and combustion.
- (B) Nitrogen retards fuel ignition.
- (C) Nitrogen impedes fuel penetration.
- (D) Nitrogen advances fuel ignition.

If choice A is selected set score to 1.

27. Clutching takes place nearest the bearing shown in the illustration, located at number _____.

Illustration MO-0086

- (A) 1
- (B) 2
- (C) 3
- (D) 4

If choice A is selected set score to 1.

28. Reduction gear casings are vented in order to __________.

- (A) allow windage to exist for cooling the gears
- (B) avoid a buildup of pressure within the gear case
- (C) minimize lube oil foaming within the case
- (D) allow for axial clearance between the gears

If choice B is selected set score to 1.
29. What prevents the thrust bearing blocks shown in the illustration from rotating within the housing? Illustration MO-0120
   o (A) The thrust shoes are dovetailed into the collar.
   o (B) The bearing assembly is specifically designed to allow for rotation, permitting the transmittal of axial forces across a greater surface area and minimizing loading densities.
   • (C) Found within the thrust bearing cap or cover are extended protrusions to position the thrust shoe segments and maintain minimum clearance.
   o (D) The bearing blocks are massive and their weight provides sufficient force to prevent rotation.

   If choice C is selected set score to 1.

30. What is the normal bearing clearance permitted at the horizontal axis of the shaft for the bearing shown in the illustration? Illustration MO-0121
   o (A) The tolerances established are dependent on machining processes used and will vary amongst manufacturers.
   o (B) The clearance is determined by the thickness of the hydrodynamic wedge formed and is not usually measured while underway.
   o (C) The clearance on one side of the shaft at the axis will be one twentieth of a millimeter.
   • (D) The normal play on both sides of the shaft will be one tenth of a millimeter.

   If choice D is selected set score to 1.

31. The gear drive, shown in the illustration, can have the backlash determined best by using a ___________. Illustration MO-0091
   o (A) lash indicator
   o (B) red dye indicator
   • (C) feeler gauge
   o (D) lead wire

   If choice C is selected set score to 1.

32. The pneumatic propulsion control system used on your vessel uses a diaphragm-operated relay valve as shown in the illustration. Periodically, the valve is to be disassembled for cleaning and inspection. What statement best describes the proper technique? Illustration MO-0052
   o (A) Rubber parts such as the diaphragm should be cleaned with non-flammable solvent, and metal parts such as the valve discs and seats should be washed with soap and water.
   o (B) Rubber parts such as the diaphragm and metal parts such as the valve discs and seats should all be cleaned with non-flammable solvent.
   o (C) Rubber parts such as the diaphragm and metal parts such as the valve discs and seats should all be washed with soap and water.
   • (D) Rubber parts such as the diaphragm should be washed with soap and water, and metal parts such as the valve discs and seats should be cleaned with non-flammable solvent.

   If choice D is selected set score to 1.
33. The vessel to which you are assigned is fitted with a totally pneumatic propulsion control system as shown in the illustration. If propulsion control functions perfectly from the engine room control station, but will not function at all from any of the remote stations, which of the following system faults best accounts for these symptoms? Illustration MO-0168

- (A) The local/remote transfer valve at the engine room control station has a blocked local port.
- (B) The pilot house/remote transfer valve at the pilot house has a blocked remote port.
- (C) The attendance valve at the pneumatic remote control station has a blocked outlet port.
- (D) The local/remote transfer valve at the engine room control station has a blocked remote port.

*If choice D is selected set score to 1.*

34. The direct acting mechanical governor used with some small diesel engines, controls fuel flow to the engine by __________.

- (A) governor flyweight action on a pilot valve which controls fuel injection
- (B) positioning a butterfly valve in the fuel delivery system
- (C) governor flyweight motion acting on fuel controls through suitable linkage
- (D) positioning a servomotor piston attached to the fuel controls

*If choice C is selected set score to 1.*

35. The function of the synchronizing motor on the generator governor illustrated is to __________. Illustration MO-0092

- (A) drive the terminal shaft at a set speed
- (B) turn the governor drive shaft during start-up
- (C) provide remote control for speed adjustment
- (D) power the generator synchronizing lamps

*If choice C is selected set score to 1.*

36. The most common contaminant of governor hydraulic fluid is __________.

- (A) moisture
- (B) dirt
- (C) acid
- (D) air

*If choice B is selected set score to 1.*

37. Adjustments to the compensating needle valve in a hydraulic governor should be made with the engine at __________.

- (A) maximum power at a normal load
- (B) maximum power and load under normal conditions
- (C) half-speed and normal temperature
- (D) normal operating temperature without a load

*If choice D is selected set score to 1.*
38. You are preparing to change the oil of the speed control governor on one of the main propulsion diesel engines on your vessel. What statement is true concerning the draining and flushing procedures?

- (A) The governor oil should be drained while the oil is cold and the governor should be flushed with the heaviest grade of the same type of oil.
- (B) The governor oil should be drained while the oil is hot and the governor should be flushed with the lightest grade of the same type of oil.
- (C) The governor oil should be drained while the oil is hot and the governor should be flushed with the heaviest grade of the same type of oil.
- (D) The governor oil should be drained while the oil is cold and the governor should be flushed with the lightest grade of the same type of oil.

*If choice B is selected set score to 1.*

39. The hunting of a diesel engine may be caused by which of the following?

- (A) Poor quality fuel.
- (B) Excessive governor control.
- (C) Fluctuations in load.
- (D) Excessive speed droop.

*If choice B is selected set score to 1.*

40. A diesel engine operates erratically, overspeeds, and fails to restart when cranked at normal speed. Which of the following problems is the most likely cause for the engine failing to restart?

- (A) Improper governor operation due to excess oil pressure
- (B) Damage to the governor due to excessive speed
- (C) Failure to reset the overspeed trip
- (D) Failure to reposition the fuel rack

*If choice C is selected set score to 1.*

41. The governor utilized with the device shown in the illustration has become inoperative while the vessel is underway at sea. Which of the following statements describes what action should be taken? Illustration MO-0119

- (A) It is necessary to disconnect the shuttle valve from the throttle lever horizontal bar, in order to effectively jump out the pneumatic engine enable control circuit.
- (B) The governor should be replaced with one that has been proven to be useful in isochronous applications.
- (C) The engine speed can be controlled using the fuel control lever without changing the position of the maximum fuel stop.
- (D) The linkage to the shut down servomotor and the governor output shaft must be disconnected in order to operate the engine via the fuel control lever.

*If choice C is selected set score to 1.*
42. When vapor is in contact with and remains at the same temperature as the boiling liquid from which it was generated, the vapor and liquid are said to be in which of the following?

- (A) critical state
- (B) latent contact
- (C) sensible contact
- (D) saturated condition

If choice D is selected set score to 1.

43. Assume that steam has formed in a boiler in which all of the steam stop valves are closed, and the water level is held constant. When there is an increase in the temperature of the steam and water in the boiler, which of the following effects will occur on the pressure and the specific volume of the steam?

- (A) The pressure will increase and the specific volume will decrease.
- (B) The pressure will remain constant and the volume will increase.
- (C) The steam pressure and volume will remain constant.
- (D) The pressure will increase and the volume will remain constant.

If choice A is selected set score to 1.

44. According to the data given in illustration, which of the following would be the physical state of the fluid at a gage vacuum of 28.09 inches Hg, and 117.99 degrees Fahrenheit? Illustration SG-0026

- (A) Subcooled liquid.
- (B) Saturated liquid.
- (C) Mixture of saturated liquid and vapor.
- (D) Superheated vapor.

If choice D is selected set score to 1.

45. Large steam drums are not required in the design of a coil-type auxiliary water-tube boiler because

- (A) automatic burner cycling controls steam volume and quality
- (B) the volume of steam is small at low pressures
- (C) the heat of combustion is sufficient to remove all moisture from the steam
- (D) the steam-water mixture that exits the coils is separated in a flash chamber

If choice D is selected set score to 1.
46. The purpose of the separating nozzle in the accumulator of a water-tube, coil-type, steam generator is to separate __________.
  • (A) condensate from feedwater
  • (B) superheated steam from saturated steam
  • (C) dry steam from the steam and water mixture
  • (D) sludge accumulations from feedwater

If choice C is selected set score to 1.

47. The rate of heat transfer in a waste-heat boiler can be increased by __________.
  • (A) operating the boiler at less than normal water level
  • (B) increasing the amount of excess air to the burners
  • (C) installing fins on the firesides of water-tubes
  • (D) treating the boiler water with chemical oxygen scavengers

If choice C is selected set score to 1.

48. The boiler shown in the illustration would be classed as __________. Illustration MO-0064
  • (A) single-pass, fire-tube, scotch marine
  • (B) two-pass, scotch marine
  • (C) two-pass, water-tube
  • (D) forced circulation, coil-type

If choice A is selected set score to 1.

49. Which of the following actions takes place in the control circuit of a semi-automatic (manual ignition) 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 stack relay actuates the low limit control which breaks the ignition circuit.
  • (C) Secures the burner circuit and prevents manual re-starting of the burner until the steam pressure falls below the set cut-in pressure.
  • (D) The stack relay secures power to the high voltage side of the ignition transformer.

If choice C is selected set score to 1.

50. 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 stack relay actuates the low limit control which breaks the ignition circuit.
  • (C) The high limit control secures power to the entire oil firing system.
  • (D) The stack relay secures power to the high voltage side of the ignition transformer.

If choice C is selected set score to 1.
51. Control of the fuel oil metering valve in an automatically fired auxiliary boiler is accomplished by a __________.

- (A) pressure magnifying device in the steam coil outlet
- (B) metering device in the air supply line
- (C) steam pressure sensing device with linkage to the damper air vanes
- (D) signal from the feedwater electrode

If choice C is selected set score to 1.

52. Which of the following statements describes how the fuel oil enters the whirling chambers of the sprayer plates used in an auxiliary boiler return flow fuel oil system?

- (A) Through the outer barrel tube.
- (B) Through the sprayer plate drilled passages.
- (C) Through tangential slots in the sprayer plate.
- (D) Through baffles in the orifice plate.

If choice C is selected set score to 1.

53. The water-tube natural-circulation steam boiler on your vessel is equipped with soot blowers for maintaining heat transfer efficiency. Which of the following statements best describes the conditions that must be met before tubes can be safely blown using the soot blowers?

- (A) The boiler draft must be decreased AND the boiler fires must be secured before tubes can be safely blown.
- (B) The boiler draft must be increased AND the boiler fires must be secured before tubes can be safely blown.
- (C) The boiler draft must be increased AND the boiler fires must be lit before tubes can be safely blown.
- (D) The boiler draft must be decreased AND the boiler fires must be lit before tubes can be safely blown.

If choice C is selected set score to 1.

54. Which of the following statements describes pertinent criteria for performing a surface blow for the purposes of removing excess chemicals and/or salinity as indicated by boiler water testing on an auxiliary steam boiler as fitted on your vessel?

- (A) The surface blow would be performed when the boiler is steaming AND the level would be maintained above normal during the duration of the blow.
- (B) The surface blow would be performed when the boiler is secured AND the level would be maintained above normal during the duration of the blow.
- (C) The surface blow would be performed when the boiler is steaming AND the level would be maintained normal during the duration of the blow.
- (D) The surface blow would be performed when the boiler is secured AND the level would be maintained normal during the duration of the blow.

If choice A is selected set score to 1.
55. If the water level as indicated by the gauge glass of an auxiliary boiler is in question, it should be blown down. Which of the following statements represents the proper procedure for performing a gauge glass blow down?

- (A) The gauge glass should be blown down twice; first with the lower cut-out valve open and then with the upper cut-out valve open.
- (B) The gauge glass should be blown down once with the lower cut-out valve open.
- (C) The gauge glass should be blown down once with both the upper cut-out and lower cut-out valves open simultaneously.
- (D) The gauge glass should be blown down twice; first with the upper cut-out valve open and then with the lower cut-out valve open.

*If choice A is selected set score to 1.*

56. Which statement most accurately represents the requirements for softening hard carbon deposits associated with the burner atomizers of an auxiliary boiler?

- (A) Carbon should be softened by soaking in sulfamic or hydrochloric acid.
- (B) Carbon should be softened by soaking in hot soapy water.
- (C) Carbon should be softened by blowing through with steam.
- (D) Carbon should be softened by soaking in diesel fuel or kerosene.

*If choice D is selected set score to 1.*

57. Which of the following conditions best describes the reason for performing a bottom blow on an auxiliary steam boiler?

- (A) Sludge removal.
- (B) Priming and carryover.
- (C) Excess chemicals and/or salinity.
- (D) High water.

*If choice A is selected set score to 1.*

58. You are observing the flame condition on an oil-fired auxiliary boiler through an observation window peep-hole. The flame is a reddish color accompanied by a noticeably panting/pulsating furnace. What would be the correlating color of the gases exhausting from the stack under these conditions?

- (A) White smoke.
- (B) Light brown haze.
- (C) Dense black smoke.
- (D) Clear stack.

*If choice C is selected set score to 1.*
59. Which of the following conditions could cause the feed pump for an auxiliary boiler to lose suction?

- (A) Increased suction head pressure
- (B) Decreased feedwater temperature
- (C) Pump recirculating line being open too much
- (D) Excessive feedwater temperature

*If choice D is selected set score to 1.*

60. As shown in the illustration, the component labeled "G" would be identified as a _______. Illustration MO-0231

- (A) waste heat boiler circulating pump
- (B) main condensate pump
- (C) boiler water feed pump
- (D) fuel oil service pump

*If choice A is selected set score to 1.*

61. As shown in the illustration, if the vessel was operating at full sea speed, the area labeled "L" would be used to _________. Illustration MO-0231

- (A) collect steam and flash the heated water generated in area "B" into steam
- (B) preheat the feedwater to the waste heat boiler
- (C) collect stack gas
- (D) superheat the steam generated by the oil fired mechanical burner

*If choice A is selected set score to 1.*

62. As shown in the illustration, the component labeled "N" would be identified as a _______. Illustration MO-0231

- (A) main condensate pump
- (B) boiler water feed pump
- (C) fuel oil service pump
- (D) waste heat boiler circulating pump

*If choice B is selected set score to 1.*

63. The water in an auxiliary boiler should be tested for chloride content to determine ____________.

- (A) total dissolved solids
- (B) water hardness
- (C) salt contamination
- (D) chlorine contamination

*If choice C is selected set score to 1.*
64. The correct procedure for giving an auxiliary boiler a bottom blow, is to begin __________.

   o (A) when the boiler has been cooled to ambient temperature
   o (B) only after raising the water level to within 1/2 inch of the high water cutout
   o (C) when the boiler has been secured long enough for most solids to settle
   o (D) only after bypassing the low-pressure pressuretrol

   If choice C is selected set score to 1.

65. When rolling over a main engine on your vessel prior to starting with the cylinder test valves open to expel any fluids accumulated within the cylinders, a rather large amount of water is discharged. What is the appropriate response?

   o (A) Start the engine, but monitor all fluid levels very closely, especially that of the jacket water.
   o (B) Do not allow the engine to be started until the cause of the water discharge has been determined and corrected.
   o (C) Start the engine, but maintain the jacket water expansion tank level higher than normal.
   o (D) Start the engine, but run the engine with the cylinder test valves cracked slightly open.

   If choice B is selected set score to 1.

66. Which of the listed conditions could result in the failure of an auxiliary diesel engine to stop running when a normal shutdown is attempted?

   o (A) Supplying high temperature inlet air.
   o (B) Maintaining a high exhaust back pressure.
   o (C) Lube oil entering in the air intake manifold.
   o (D) Carbon buildup on the overspeed pawl.

   If choice C is selected set score to 1.

67. While proceeding in open waters, one of the main engines on your vessel overheats. The high jacket water temperature alarm sounds, the fresh water thermometers indicate out of range (high), and the expansion tank level sight glass indicates out of range (high) with vapor bubbles forming and escaping through the vent. What is the appropriate initial response?

   o (A) Drain water from the expansion tank.
   o (B) Shut down the engine immediately.
   o (C) Reduce the load and speed on the engine.
   o (D) Add makeup water to the expansion tank.

   If choice C is selected set score to 1.
68. If a diesel engine has been stopped because of piston seizure due to severe overheating, the crankcase __________.
   o (A) ventilation system should be continued in operation for one hour for cooling
   o (B) explosion covers should be opened slightly to provide extra ventilation
   • (C) inspection covers should not be opened until the engine has cooled
   o (D) scavenge pump should be immediately secured to prevent loss of lube oil

   *If choice C is selected set score to 1.*

69. You suspect that the diesel generator in service on your vessel has a low coolant level. Assuming that the cooling water system is pressurized and has no sight glass associated with the expansion tank, which of the following represents the proper procedure for checking the coolant level?

   • (A) Shut down the engine and allow the engine to cool.
     With a rag, very slowly remove the pressure cap to relieve the system pressure.
     With the cap removed, check the coolant level.
   o (B) Allow the engine to continue to run with a normal load.
     With a rag, very slowly remove the pressure cap to relieve the system pressure.
     With the cap removed, check the coolant level.
   o (C) Allow the engine to continue to run, but with the load removed.
     With a rag, very rapidly remove the pressure cap to relieve the system pressure.
     With the cap removed, check the coolant level.
   o (D) Shut down the engine.
     With a rag, very rapidly remove the pressure cap to relieve the system pressure.
     With the cap removed, check the coolant level.

   *If choice A is selected set score to 1.*

70. Which of the listed items should be secured before performing any maintenance on a solenoid operated air start valve?

   o (A) Hydraulic switch and engage jacking gear
   o (B) Lube oil standby pump and control air
   • (C) Electric power and starting air
   o (D) Motor drain and pneumatic control system power

   *If choice C is selected set score to 1.*
MO-0031
FIG. A: APPLIED POSITION

Supply Valve Disc

FIG. B: RELEASED POSITION

Exhaust Valve Disc
7N1889 & 8N9662 Drive Groups Used With UG8-L Woodward Governors
1W2135 Drive Group Used With Caterpillar 3161 Governors

1. Diameter of bore in adapter (2) ............................................ 34.072 ± 0.025 mm (1.3414 ± .0010 in.)
   Diameter of shaft on governor drive pinion (3) .................... 34.000 ± 0.013 mm (1.3386 ± .0005 in.)

2. Adaptor

3. Governor drive pinion

4. Bevel gear

5. Diameter of shaft on bevel gear (4) ................................. 34.000 ± 0.013 mm (1.3386 ± .0005 in.)
   Diameter of bore in bearing after assembly in drive housing ... 34.072 ± 0.039 mm (1.3414 ± .0015 in.)

6. Shims. Use as required to get a gear clearance (backlash)
   between pinion (3) and gear (4) of .................................. 0.100 ± 0.050 or -0.025 mm (.0039 = 0.020 or -.0010 in.)

7. Diameter of bore in drive housing ................................... 40.432 ± 0.025 mm (1.5918 ± .0010 in.)
   Diameter of bearing ...................................................... 40.545 ± 0.013 mm (1.5963 ± .0005 in.)
MO-0119

Fuel Control Linkage Arrangement

Adapted for testing purposes only from SULZER, Description of and Operating Instructions for Sulzer Diesel Engines RND-M

Copyright © Sulzer Brothers Limited
Further reproduction prohibited without permission
Thrust Bearing

<table>
<thead>
<tr>
<th>Nominal dimension</th>
<th>Normal play</th>
<th>Max. play (worn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f = 200$</td>
<td>$f_1 = 1.0$</td>
<td>2.0</td>
</tr>
<tr>
<td>$g = 540$</td>
<td>$g_1 = \text{min. 0.10}$</td>
<td></td>
</tr>
<tr>
<td>$G = 540$</td>
<td>$h = +0.46 +0.30$</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>$i_1, i_2 = 5$</td>
<td></td>
</tr>
<tr>
<td>$k = 20$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RND 68 Principal Clearances Crankshaft and Thrust Bearing**

Adapted for testing purposes only from SULZER, Description of and Operating Instructions for Sulzer Diesel Engines RND-M

Copyright © Sulzer Brothers Limited

Further reproduction prohibited without permission
National Maritime Center
Serving Our Nation's Mariners

MO-0168
Pneumatic Propulsion Control System

Adapted for testing purposes only from Falk Marine Reduction Drives, Installation, Operation and Maintenance Manual
Copyright © 1976 Faulk
Further reproduction prohibited without permission.

10/25/2018
# Properties of Saturated Steam

<table>
<thead>
<tr>
<th>Vacuum Inches of Hg Gage</th>
<th>Temperature °C</th>
<th>Temperature °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>29.51</td>
<td>11.74</td>
<td>53.14</td>
</tr>
<tr>
<td>29.41</td>
<td>15.17</td>
<td>59.30</td>
</tr>
<tr>
<td>29.31</td>
<td>18.04</td>
<td>64.47</td>
</tr>
<tr>
<td>29.21</td>
<td>20.52</td>
<td>68.93</td>
</tr>
<tr>
<td>29.11</td>
<td>22.70</td>
<td>72.86</td>
</tr>
<tr>
<td>29.00</td>
<td>24.66</td>
<td>76.38</td>
</tr>
<tr>
<td>28.90</td>
<td>26.43</td>
<td>79.58</td>
</tr>
<tr>
<td>28.70</td>
<td>29.56</td>
<td>85.21</td>
</tr>
<tr>
<td>28.49</td>
<td>32.27</td>
<td>90.08</td>
</tr>
<tr>
<td>28.29</td>
<td>34.66</td>
<td>94.38</td>
</tr>
<tr>
<td>28.09</td>
<td>36.80</td>
<td>98.24</td>
</tr>
<tr>
<td>27.88</td>
<td>38.74</td>
<td>101.74</td>
</tr>
<tr>
<td>27.48</td>
<td>42.18</td>
<td>107.92</td>
</tr>
<tr>
<td>27.06</td>
<td>45.14</td>
<td>113.26</td>
</tr>
<tr>
<td>26.66</td>
<td>47.77</td>
<td>117.99</td>
</tr>
<tr>
<td>26.26</td>
<td>50.13</td>
<td>122.23</td>
</tr>
<tr>
<td>25.85</td>
<td>52.27</td>
<td>126.08</td>
</tr>
<tr>
<td>25.44</td>
<td>54.23</td>
<td>129.62</td>
</tr>
<tr>
<td>25.03</td>
<td>56.05</td>
<td>132.89</td>
</tr>
<tr>
<td>24.63</td>
<td>57.74</td>
<td>135.94</td>
</tr>
<tr>
<td>24.22</td>
<td>59.33</td>
<td>138.79</td>
</tr>
<tr>
<td>23.81</td>
<td>60.82</td>
<td>141.48</td>
</tr>
<tr>
<td>22.79</td>
<td>64.21</td>
<td>147.57</td>
</tr>
<tr>
<td>21.78</td>
<td>67.21</td>
<td>152.97</td>
</tr>
<tr>
<td>20.76</td>
<td>69.91</td>
<td>157.83</td>
</tr>
<tr>
<td>19.74</td>
<td>72.36</td>
<td>162.24</td>
</tr>
<tr>
<td>18.72</td>
<td>74.61</td>
<td>166.30</td>
</tr>
<tr>
<td>17.70</td>
<td>76.70</td>
<td>170.06</td>
</tr>
<tr>
<td>16.69</td>
<td>78.64</td>
<td>173.56</td>
</tr>
<tr>
<td>15.67</td>
<td>80.47</td>
<td>176.85</td>
</tr>
<tr>
<td>14.65</td>
<td>82.14</td>
<td>179.86</td>
</tr>
<tr>
<td>13.63</td>
<td>83.81</td>
<td>182.86</td>
</tr>
<tr>
<td>12.61</td>
<td>85.36</td>
<td>185.64</td>
</tr>
<tr>
<td>11.60</td>
<td>86.82</td>
<td>188.28</td>
</tr>
<tr>
<td>10.58</td>
<td>88.22</td>
<td>190.80</td>
</tr>
<tr>
<td>9.56</td>
<td>89.57</td>
<td>193.21</td>
</tr>
<tr>
<td>7.52</td>
<td>92.08</td>
<td>197.75</td>
</tr>
<tr>
<td>5.49</td>
<td>94.42</td>
<td>201.96</td>
</tr>
<tr>
<td>3.45</td>
<td>96.60</td>
<td>205.88</td>
</tr>
<tr>
<td>1.42</td>
<td>98.64</td>
<td>209.56</td>
</tr>
</tbody>
</table>

Adapted for testing purposes only
Further reproduction prohibited without permission