PDH Academy

# Final Exam
## Centrifugal Pump Selection

1. How does a centrifugal pump move fluid?
- ○ a. Positive displacement
- ○ b. Negative displacement
- ○ c. Spinning impeller

2. What is another name for a centrifugal pump?
- ○ a. Radial flow pump
- ○ b. Mixed flow pump
- ○ c. Axial flow pump

3. What are the three different types of impellers for a centrifugal pump?
- ○ a. Fast, medium, slow
- ○ b. Open, semi-enclosed, enclosed
- ○ c. Thin, semi-thick, thick

4. What is a common industry guide for the design of pumping systems?
- ○ a. Hydraulic Institute Standards
- ○ b. NFPA 820
- ○ c. AWWA Standard E503

5. When should the design criteria be defined during the design process?
- ○ a. Near the end of the design process
- ○ b. Anytime is acceptable
- ○ c. Near the beginning of the design process

6. Which of the following is NOT a design criteria?
- ○ a. Peak design flow of 1,000 gpm at 40 psi
- ○ b. Salvage value
- ○ c. Pass solid sphere of minimum 3" diameter

7. What do you call the design flow that includes potential future developments?
- ○ a. Average design flow
- ○ b. Ultimate design flow
- ○ c. Peak design flow

8. Which are methods for measuring flow rates on an existing pump station?
- ○ a. Install a flow meter, use flow source data, or use pump run times
- ○ b. Install a flow meter, use pipe diameter, or use pump run times
- ○ c. Install a flow meter, use consumption data, or use motor voltage.

9. Which is NOT a benefit of a duplex pump arrangement?
- ○ a. Simple design
- ○ b. Covers greater range of flows and pressures
- ○ c. Low construction cost

10. When may three or more pumps be justified?
- ○ a. Large flows, large peak factor, large pressure range
- ○ b. Small flows, large peak factor, large pressure range
- ○ c. Large flows, large peak factor, small pressure range

11. Which is a benefit to variable speed control?
- ○ a. Simple controls and programming
- ○ b. May allow fewer pumps
- ○ c. Controls have longer life when outdoors

12. What is a process flow diagram?
- ○ a. Elevation view with hydraulic grade line
- ○ b. Preliminary site plan
- ○ c. Schematic showing major components and piping

13. Which should be larger: NPSHr or NPSHa?
- ○ a. NPSHr
- ○ b. NPSHa
- ○ c. Should be equal

14. What is a system curve?
- ○ a. Plot of TDH versus flow
- ○ b. Plot of TDH versus pressure
- ○ c. Plot of pump operating points

15. Which condition justifies plotting two system curves?
- ○ a. Pumping from a wet well with a high and low water surface elevations
- ○ b. Having a long pipeline
- ○ c. Pulling a lift

16. Which formula represents TDH?
- ○ a. TDH = minor losses + pipe friction + static
- ○ b. DH = minor losses + major losses + static
- ○ c. DH = minor losses + dynamic losses + static

17. What is a common method for calculating minor losses?
- ○ a. NPSH
- ○ b. Hazen-Williams
- ○ c. K-Value Method

18. Which are the inputs for the Hazen Williams equation?
- ○ a. Pressure, friction coefficient, flow rate, pipe diameter
- ○ b. Pipe length, friction coefficient, flow rate, pipe diameter
- ○ c. Pipe length, K-Value, flow rate, pipe diameter

19. For a pump station with different size pumps, how can the system curves be calculated?

- a. Assume branch losses are equal, modeling, or pump curves with branch losses
- b. Iterative calculations, modeling, or pump curves with branch losses
- c. Iterative calculations, modeling, or estimate the flow in each branch

20. If the low flow point cannot be achieved by reducing the pump speed, what can be done?
- a. Use a combination of large and small pumps
- b. Increase the pump size
- c. Decrease the number of pumps

21. What tool can be used to identify pump models that meet the required flow and pressure?
- a. Efficiency calculator
- b. Review charts of pump capacity ranges
- c. Process flow diagram

22. When comparing two pump curves, which factors should be considered?
- a. Efficiency at average flow, inlet size, and slope of the curve
- b. Stall condition, runout condition, and slope of the curve
- c. Efficiency at average flow, preferred operating range, and slope of the curve

23. What method is used to calculate reduced speed pump curves?
- a. Affinity Laws
- b. Bernoulli's Equation
- c. Reynolds Number

24. How do you calculate a combined curve for two pumps in parallel?
- a. Add the pump heads for each flow
- b. Add the pump flows for each head value
- c. Add the pump flows and heads

25. For a hydraulic profile, what does the vertical rise at a pump represent?
- a. Head losses in the piping
- b. Static losses
- c. TDH of the pump